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## MBA PROFESSIONAL REPORT

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**An Analysis of United States Marine Corps Enlisted Entry-Level Training Using Supply Chain and Operations Management**

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**December 2010**

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The Enlisted Entry-Level Training (EELT) pipeline is a complex network that is of vital importance to the U.S. Marine Corps' ability to maintain a balanced force and serve as the nation's force in readiness. This report provides an all-inclusive description of the EELT pipeline by identifying the fundamental steps in the supply chain, analyzing the supply chain's critical characteristics, and providing informed recommendations related to operations and supply chain management in an effort to help synchronize the flow of human inventory through the EELT network.

The report recommends six initiatives that have the potential to reduce queuing, minimize P2T2, and decrease total costs. The first proposed recommendation is to level load trainees to the training pipeline throughout the year; second, develop a pull inventory system by eliminating PEF code assignments and postponing trainee classification; third, decrease capacity at the recruit depots and increase capacity at Marine Combat Training schools; fourth, maximize training capacity during the ONDJ trimester by employing all available resources and reducing lost time during the year-end holiday break; fifth, enhance the Marine Corps Training Information Management System through incentives, automation, and interoperability; and sixth, develop an EELT Supply Chain Process Owner focused on integrating processes across the supply chain.

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**AN ANALYSIS OF UNITED STATES MARINE CORPS ENLISTED ENTRY-LEVEL TRAINING USING SUPPLY CHAIN AND OPERATIONS MANAGEMENT**


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# AN ANALYSIS OF UNITED STATES MARINE CORPS ENLISTED ENTRY-LEVEL TRAINING USING SUPPLY CHAIN AND OPERATIONS MANAGEMENT

## ABSTRACT

The Enlisted Entry-Level Training (EELT) pipeline is a complex network that is of vital importance to the U.S. Marine Corps' ability to maintain a balanced force and serve as the nation's force in readiness. This report provides an all-inclusive description of the EELT pipeline by identifying the fundamental steps in the supply chain, analyzing the supply chain's critical characteristics, and providing informed recommendations related to operations and supply chain management in an effort to help synchronize the flow of human inventory through the EELT network.

The report recommends six initiatives that have the potential to reduce queuing, minimize P2T2, and decrease total costs. The first proposed recommendation is to level load trainees to the training pipeline throughout the year; second, develop a pull inventory system by eliminating PEF code assignments and postponing trainee classification; third, decrease capacity at the recruit depots and increase capacity at Marine Combat Training schools; fourth, maximize training capacity during the ONDJ trimester by employing all available resources and reducing lost time during the year-end holiday break; fifth, enhance the Marine Corps Training Information Management System through incentives, automation, and interoperability; and sixth, develop an EELT Supply Chain Process Owner focused on integrating processes across the supply chain.

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# LIST OF ACRONYMS AND ABBREVIATIONS

ASR    Authorized Strength Report

CDD    Course Descriptive Data

CGIP    Commanding General's Inspection Program

DC M&RA  Deputy Commandant Manpower and Reserve Affairs

EELT    Enlisted Entry-Level Training

FLC    Formal Learning Center

FMAM   February, March, April, May

FRASF   Awaiting Formal Training

FSTD    Formal Schools Training Division

GAR    Grade Adjusted Recapitulation

JJAS    June, July, August, September

MAT    Marines Awaiting Training

MEPS    Military Entrance Processing Station

MCB    Marine Corps Base

MCCDC   Marine Corps Combat Development Command

MCCES   Marine Corps Communication-Electronics School

MCO    Marine Corps Order

MCRC    Marine Corps Recruiting Command

MCRD    Marine Corps Recruit Depot

MCT    Marine Combat Training

MCTFS   Marine Corps Total Force System

MCTIMS   Marine Corps Training Information Management System

MMEA   Manpower Management Enlisted Assignments

MOS    Military Occupational Specialty

MPP    Manpower Plans and Policy

NAS    Naval Air Station

OELT    Officer Entry-Level Training

OM    Operations Management

| | |
|---|---|
| ONDJ | October, November, December, January |
| P2T2 | Patients, Prisoners, Trainees, and Transients |
| PEF | Program Enlisted For |
| POI | Program of Instruction |
| PRASP | Permissive Recruiter Assistance Support Program |
| RDM | Recruit Distribution Model |
| ROFT | Rush Order Flow Time |
| SCM | Supply Chain Management |
| SOP | Standard Operating Procedures |
| STF | Street to Fleet |
| TAT | Time Awaiting Training |
| TECOM | Training and Education Command |
| TFSD | Total Force Structure Division |
| TFSP | Total Force Structure Process |
| TRNGCMD | Training Command |
| TIP | Training Input Plan |
| T/L | Troop List |

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# EXECUTIVE SUMMARY

The Enlisted Entry-Level Training (EELT) pipeline is a complex network that is of vital importance to the U.S. Marine Corps' ability to maintain a balanced force and serve as the nation's force in readiness. This report provides an all-inclusive description of the enlisted entry-level training pipeline by identifying the fundamental steps in the supply chain, analyzing the supply chain's critical characteristics, and providing informed recommendations related to operations and supply chain management in an effort to help synchronize the flow of human inventory through the EELT network.

Based on the analysis of the EELT supply chain, this report offers six principle conclusions that represent the most notable characteristics of the pipeline. Following each conclusion, a recommended course of action is presented with the targeted stakeholders listed in parentheses.

**Conclusion 1**: MCRC is overburdened with large shipping volumes in the summer months, placing a significant strain on the supply chain between June and September at the recruit depots and from October to January at the Marine Combat Training (MCT) schools and Formal Learning Centers (FLC).

**Recommendation**: Level load the distribution of trainees to the training pipeline such that one third of the annual accession enters the pipeline in each trimester. This recommendation can be implemented through a wider application of bonuses and delayed entry program management. This will allow for an even distribution of inventory throughout the pipeline across the operating year, which will result in the requirement for less pipeline capacity and a more balanced utilization of training resources throughout the fiscal year. (DC M&RA, MCRC, TECOM)

**Conclusion 2**: The EELT supply chain is a push inventory system that leads to variability in the arrival of trainee inventory to the Military Occupational Specialty (MOS) FLCs, which complicate efforts to optimize scheduling and minimize trainee delay throughout the operating year.

**Recommendation**:   Develop the EELT supply chain into a pull inventory system.  Eliminate the PEF code assignment and reposition the classification process from recruit training to MCT in order to distribute inventory based on the demands of the MOS schools, which will mitigate costly trainee wait time and reduce P2T2.  (DC M&RA, MCRC, TECOM)

**Conclusion 3**:  The data show that the recruit depots have excess annual trainee capacity as evidenced by low trimester utilization rates with an average of 60 percent and a maximum value of 84 percent.  Similarly, the data demonstrates that the MCT schools have an insufficient level of annual trainee capacity as evidenced by a utilization rate of 101 percent during the October through January trimester.

**Recommendation**:  Decrease annual training capacity at the recruit depots and increase annual training capacity at the MCT schools.   This recommendation will mitigate the costs of holding excess capacity at the recruit depots, as well as the costs associated with over utilization and inventory accumulation at the MCTs during ONDJ.

**Conclusion 4**:  The planned scheduling respites that FLCs implement during the calendar year-end holiday period occur during the EELT pipeline's most demanding throughput interval.  This interruption further aggravates an already stressed pipeline and results in lost training capacity and increased trainee wait time.

**Recommendation**:  Take full advantage of available capacity at Marine Combat Training (MCT) schools and Formal Learning Centers (FLC) during the October through January trimester by scheduling the maximum number of courses during that time period. Additionally, mitigate the impact of the year-end holiday respite by training through the holidays or by exploring scheduling practices that minimize the number of training days lost.  (TRNGCMD)

**Conclusion 5**:   The Marine Corps Training Information Management System (MCTIMS) has the potential to be a core competency for optimizing the flow of trainee inventory in the EELT pipeline but it is currently a missed opportunity.

**Recommendation**:   Develop and enhance the MCTIMS information management system and improve its data accuracy by incentivizing organizational use of MCTIMS, developing an automated MCTIMS trainee visibility capability, and establishing interoperability between MCTIMS and other entry-level training information technology systems both internal and external to the Marine Corps (i.e., Recruit Distribution Model and the Army Training Management System).  (TECOM)

**Conclusion 6**:   A global process improvement approach involving integration among the four major EELT organizations (TFSD, DC M&RA, MCRC, TECOM) is critical towards developing and implementing sustainable methods of improving the performance of the supply chain.

**Recommendation**:   Establish a global supply chain approach toward EELT process improvement through the development of an EELT Supply Chain Process Owner focused on integrating the supply chain in order to achieve reductions in inventory, total costs and P2T2 overhead.  (MCCDC, DC M&RA, MCRC, TECOM)

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# I.    INTRODUCTION

## A.    INTRODUCTION

The Enlisted Entry-Level Training (EELT) Pipeline is a complex network that is of vital importance to the U.S. Marine Corps' ability to maintain a balanced force and serve as the nation's force in readiness.  This report provides an all-inclusive view of the enlisted entry-level training pipeline by identifying the fundamental steps in the supply chain, analyzing the supply chain's critical characteristics, and providing informed recommendations related to supply chain management in an effort to help synchronize the flow of human inventory through the EELT process.  This chapter will discuss what inspired the research topic, the scope of the research, the value of EELT improvement to the Marine Corps and the research collection methods employed.

## B.    BACKGROUND

The inspiration for this research report originated from Training Command Headquarters, USMC in Quantico, Virginia.  The following paragraphs provide a brief history of Training and Education within the Marine Corps and how Training Command influenced the desire to pursue the subject of the enlisted entry-level training pipeline.

In July 2000, Training and Education Command (TECOM) was established as a new organization under the leadership of Major General Thomas S. Jones (Brill, 2001, p. 37).  TECOM's new mission was that of managing and integrating all formal training and education within the Marine Corps from recruit training to advanced and professional education.    Prior to TECOM's activation, the responsibility of formal training management belonged to a division within Marine Corps Combat Development Command.  The new TECOM was structured with a Headquarters element and two subordinate organizations, Training Command and Education Command.

Training Command's primary focus became the management, oversight and execution of the formal training pipeline.  However, in 2002 the Training Command staff was consolidated under TECOM, leaving the group's focus divided between its own tasks and those of the Training and Education Command Headquarters (Moses, 2009).

In February 2009, the Marine Corps' 202K end-strength initiative paved the way for Training Command's official split from TECOM and the establishment of a fully staffed Headquarters under the leadership of Colonel Andrew MacMannis. A ribbon cutting ceremony was held on 27 February 2009 to recognize the official formation of the Training Command staff. However, more importantly, it symbolized a renewed and concerted effort to analyze and evaluate training across the Marine Corps, as well as gain greater visibility and control over the flow of trainees throughout the entry-level training pipeline. Finally, it was Training Command's interest in sponsoring third-party research that inspired this study. Training Command's willingness to explore new ideas provided the impetus for this report to examine the EELT pipeline from a global perspective in an effort to establish sustainable methods of improving the supply chain.

## C.    PROJECT SCOPE

The metric used to evaluate the efficiency of the Marine Corps EELT pipeline is trainee throughput from the training establishment to the operational forces. In other words, does the pipeline produce the right number of Marines in the right MOSs each year, within an acceptable lead time in order to sustain a balanced enlisted force? In some respects, that metric is independent of the total cost associated with achieving that end result. However, the cost of doing business within the Department of Defense has been under increased scrutiny as the federal deficit reaches historical highs and discretionary budgets become a potential target for aiding in the reduction of the nation's debt.

As is the case in most supply chains, it benefits the Marine Corps to drive pipeline costs down while continuing to meet the required throughput and training values demanded by the institution. Put another way, the objective is to deliver the right number of trained Marines to the operational forces while maintaining training excellence and minimizing total costs.

This report focuses on a synchronized approach to the EELT supply chain in order to reduce total costs. A synchronized approach involves integrating the supply chain from beginning to end while optimizing operational practices in between. The

research methodology establishes a synchronized approach through the use of two business disciplines, supply chain management and operations management. Supply chain management focuses on the integration of the entire network, while operations management seeks to improve how the individual processes in the pipeline operate internally in terms of capacity and throughput and with one another in terms of inventory. Both fields are concerned with optimizing the way organizations operate so that the total cost of running the organization is minimized. Less money spent on producing the product often means more money to grow the institution through investment and savings. Given a fixed or declining budget, the less the Marine Corps spends on the trainee process the more flexibility it has to enhance its warfighting capabilities.

This research report solely focuses on the enlisted entry-level training pipeline. The EELT is related but different from the officer entry-level training pipeline and the advanced training pipeline. The significance of the EELT supply chain is that its network and annual throughput is considerably larger than that of the officer and advanced training pipelines. Therefore, from a return on investment perspective, the EELT pipeline offers a substantial opportunity to reduce total costs.

## D.     IMPORTANCE OF STUDYING THE EELT SUPPLY CHAIN

The EELT supply chain is a critical component of the Marine Corps' operational readiness. With an annual throughput of approximately 30,000 trainees, the EELT pipeline replenishes nearly fifteen percent of the Marine Corps' total strength each fiscal year. The pipeline transforms ordinary citizens into extraordinary warfighters that specialize in nearly two hundred different military occupations. The EELT pipeline must operate efficiently to facilitate having the right Marines, in the right MOSs, at the right time to support operational commitments abroad. Three areas highlight the importance of the EELT supply chain: P2T2, enlistment time, and operational costs.

**P2T2**:  P2T2 stands for patients, prisoners, trainees, and transients. These four categories represent personnel that are not assignable to the operational forces. The total number of P2T2 personnel in the Marine Corps is critical because it detracts from the available manning resources that can be assigned to operational billets. The majority of

the P2T2 account, approximately 80 percent, is comprised of trainees who have not completed initial entry training and non-accession trainees enrolled in courses that are in excess of 20 weeks.

The significance of P2T2 is that the personnel within the account are an overhead cost to the Marine Corps and not assignable within the operating forces. Hence, P2T2 detracts from end-strength. For example, if the P2T2 account is 30,000 Marines and the allowed end-strength for the Marine Corps is approved at 202,000 then the size of the operational forces is restricted to 172,000 Marines. Therefore, if the number of trainees in the EELT pipeline rises then the P2T2 account increases and the size of the operational force is accordingly reduced.

The P2T2 effect on end-strength is similar to that of a manufacturing firm. For example, a manufacturing organization must maintain raw materials inventory on hand in order to produce their product. Given the same level of production, larger raw materials inventory requires greater capital investment, which prevents the firm from operating at peak performance. The same occurs when the Marine Corps' P2T2 account is excessively high. As the inventory in the EELT pipeline increases, the Marine Corps' ability to fill critical warfighting billets is drastically reduced. Consequently, the objective is to reduce P2T2 to the lowest level possible.

**Enlistment Time**: Another point of view that illustrates the importance of studying the EELT system is the length of time that it takes trainees to cycle through the training pipeline. If a particular entry-level MOS training track takes six months to complete but the average trainee spends twelve months in the pipeline due to excessive wait time, then trainees spend an additional twelve percent of their four-year enlistment contract in the training establishment and not in the operational forces. As a result, the Marine Corps' return on investment for that trainee is reduced, meaning that the benefit that the Marine Corps obtains from the trainee decreases while the cost to train the member remains the same.

Simply put, the Marine Corps does not get the maximum benefit from their investment. Therefore, in order for the Marine Corps to maximize the utility of each enlistment contract, they must minimize the time that trainees spend in the enlisted entry-level training pipeline and maximize the time that they spend in the operational forces. With nearly 30,000 trainees entering the Marine Corps each year, the opportunity for improvement is significant. For example, if the average cycle time for each entry-level trainee were reduced from 200 days to 198 days, it would be the equivalent of having an additional 164 Marines worth of end-strength for one year. To put that into perspective, there are approximately 176 enlisted Marines within one Rifle Company.

**Operational Costs:** In addition to reduced personnel readiness and decreased return on investment, the Marine Corps also incurs additional costs with an EELT pipeline that holds more inventory (trainees) than is needed to meet the required demand. Such costs include various base support requirements, increased stress on instructors and support staff, reduced trainee skills retention, and increased risk of trainee atrophy and attrition. A similar dynamic occurs within the private sector. Manufacturing and retail firms have learned that holding additional inventory for longer periods of time results in added storage costs and increased probability of product obsolescence, pilferage, and loss. Consequently, many for-profit organizations have subscribed to the practice of lean manufacturing, which promotes the reduction of waste and the idea that it is more efficient and cost effective to keep as little inventory on hand as possible while maintaining the required level of production. The Marine Corps stands to benefit from reduced costs and increased operational efficiency by operating a lean EELT supply chain.

The EELT supply chain is an integral link to the success of the Marine Corps. An EELT supply chain that minimizes P2T2, maximizes the return on enlistment contracts, and eliminates waste provides a significant and lasting benefit to the continued achievement of the organization's strategic vision. The next section provides a description of the research approach.

## E. RESEARCH APPROACH

The research of the enlisted entry-level training pipeline was initiated by discussions with the G-3 Operations Section at Training Command. As a relatively new organization, Training Command was interested in exploring new and innovative methods of improving their ability to optimize the flow of the enlisted entry-level training pipeline and reduce trainee wait time. Following the initial introduction with Training Command, the research was continued by holding a series of phone calls with the Training Command G-5, Training Command G-3 Future Operations Section, TECOM Formal Schools Training Division, and MPP-20. An on-site visit to Training Command Headquarters in Quantico, Virginia was conducted with the G-3 and G-5. During that visit, a discussion with the Director and lead analyst for TECOM Formal Schools Training Division was held, followed by a meeting with MMEA-11. Additionally, a phone meeting was held with the director of EELT operations for the Marine Corps Detachment located aboard the Army's Fort Leonard Wood installation in Missouri.

In conjunction with fact-finding phone conversations with EELT stakeholders, the study examined related research theses and projects completed at the Naval Postgraduate School and other research institutions. For all quantitative analysis, the report used the FY-11 Training Input Plan available through the Marine Corps Training Information Management System (MCTIMS). For capacity data, the report used the various Programs of Instruction and Course Descriptive Data documents available in MCTIMS. The research also reviewed various Marine Corps Orders, Standard Operating Procedures (SOPs), PowerPoint presentation files, and Marine Corps websites.

## F. CONCLUSION

This chapter identifies the purpose, background, scope and significance of the research, as well as the methodology and resources employed to analyze the data. The following chapters will provide a literature review, overview of the methodology used, a description of the EELT process, analysis and observations of the EELT supply chain, summary, conclusions and recommendations.

## II.     LITERATURE REVIEW

### A.     INTRODUCTION

The objective of this chapter is to identify and describe the body of research that has been conducted on the subject of entry-level training process improvement and to distinguish that body of work from the research conducted in this report.  The literature review is organized into three core areas, which include Marine Corps Enlisted Entry-Level Training (EELT), Marine Corps Officer Entry-Level Training (OELT), and Army Enlisted Entry-Level Training.  A discussion of the three research areas is provided next along with a description of how this research report is both similar and different from the studies that have preceded it.

### B.     MARINE CORPS EELT RESEARCH

There are five research reports that specifically apply to the Marine Corps EELT pipeline.  They include a 1995 Marine Corps Gazette article written by Liddell, two linear programming model theses by Whaley and Detar in 2001 and 2004 respectively, and two studies on the Marine Corps' Communication-Electronics School (MCCESS) by Justice and Neu in 1993 and 2008 respectively.  A discussion of these research reports is provided below.

**Liddell, 1995:**  Liddell's Gazette article titled "Problems in the Pipeline" focuses on enhancing the EELT pipeline by reducing the average amount of time that it takes for trainees to complete the entry-level training continuum.  Liddell's article suggests that the Marine Corps could reduce the length of the training pipeline by combining recruit training and Marine Combat Training (MCT) in an effort to eliminate redundant administrative and supply activities.  Additionally, Liddell's article proposes that training managers should diagnose problems in the pipeline from a total-system perspective and not from the view of individual fragments.

This research report is similar to Liddell's study in that it focuses on opportunities for synchronizing the EELT pipeline in an effort to reduce trainee wait

time. Where this research report differs is that it takes a global perspective of the entire EELT process to include the roles and actions of those organizations that supply trainees to the training establishment. This report also takes a quantitative approach to demonstrate key characteristics of the EELT network such as system capacity and utilization rates at different phases of the pipeline. Liddell's article, on the other hand, is exclusively qualitative. Finally, the Marine Corps' EELT system has undergone a number of changes since the Liddell article was published. Consequently, this report evaluates the current environment in an effort to uncover sustainable methods of improving the efficiency of the Marine Corps EELT pipeline with regard to trainee wait time.

**Whaley 2001, Detar 2004:** The Whaley and Detar studies utilize linear programming for optimal Military Occupational Specialty (MOS) school scheduling practices in an effort to minimize Marine Awaiting Training (MAT) throughout the Marine Corps EELT pipeline. Whaley's study, titled "Scheduling the recruiting and MOS training of enlisted Marines", proposes two linear programming models that coordinate recruiting efforts with MOS school scheduling. The first model produces an initial MOS school scheduling plan that corresponds to the Accession Plan two years prior to execution. The second model develops a MOS school scheduling plan in conjunction with an updated Program Plan one year prior to execution. Detar's research titled "Scheduling Marine Corps entry-level MOS schools", on the other hand, recommends an integer-linear program model that coordinates MOS school scheduling with both the Program Plan and Classification Plan.

The goal of Whaley and Detar's research was to minimize the accumulation of inventory within the Marine Corps EELT pipeline by improving MOS school scheduling. Their research methodology involved the use of linear programming to achieve that end. The goal of this research report is similar to that of Whaley and Detar in that the objective is to identify opportunities to reduce MAT and consequently reduce inventory accumulation. The primary difference between this research report and those of Whaley and Detar is the methodology used. This research report employs Operations Management and Supply Chain Management methodologies which differ from the

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approach taken by Whaley and Detar. Additionally, this research report takes a more global perspective of the EELT pipeline by identifying all organizations and activities from end strength, force structure and manpower planning to the training processes for all Enlisted Entry-Level Training MOS paths.

**Justice 1993, Neu 2008:** The research by Justice and Neu focuses specifically on the optimal scheduling of classes at Marine Corps Communication-Electronics School (MCCES) in an effort to minimize MAT queues for enlisted entry-level trainees. The Justice research, titled "A scheduling model for the U.S. Marine Corps Communication-Electronics School", proposes a mixed-integer program (MIP) that optimally schedules the sequence of classes at MCCES so that trainees proceed more quickly to their subsequent assignments. Neu's research, titled U.S. Marine Corps Communication-Electronics School training process: Discrete-event simulation and lean", on the other hand, discovers that variability in trainee arrival rates causes large MAT queues at MCCES. Consequently, Neu recommends an on-demand scheduling system that proves successful in reducing queues using simulation modeling software.

The objective of the Justice and Neu research is to reduce trainee queuing at MCCES. Their research objective is similar to the goals of this research report in that both seek to uncover methods that will lead to the reduced occurrence of trainee queuing and MAT time within the EELT pipeline. The prominent difference is that this report uses supply chain and operations management methodologies in an effort to reduce trainee queuing at all phases of the EELT pipeline to include recruit training, MCT, and MOS formal school locations.

## C.      MARINE CORPS OFFICER ELT (OELT) RESEARCH

**Grant 2002:** Grant's research titled "Minimizing time awaiting training for graduates of The Basic School", proposes an integer-linear programming model to minimize time awaiting training (TAT) by newly classified Marine Officers, while providing equity of opportunity for all officers to seek their desired MOS. The integer-linear programming model seeks to optimally distribute annual MOS classification quotas to each graduating company at The Basic School (TBS). This linear programming model

seeks to satisfy two objective functions. The first is to minimize TAT, while the second is to minimize the number of officers who fall outside the desired minimum and maximum assignment quota for each MOS.

Grant utilizes a linear programming model to minimize TAT by optimizing the assignment process of MOS's to Marine Corps Officer entry-level trainees. This research report is similar in that it also pursues methods to minimize TAT for entry-level trainees. However, the primary difference is that this research report applies supply chain and operations management techniques vice the linear programming approach employed by Grant. Additionally, there is a significant disparity in the scope of the two studies. Grant's work involves Marine Corps Officer accessions, which has a throughput of approximately 2,000 trainees per year. In contrast, this research report studies Marine Corps Enlisted accessions, which has an annual throughput of approximately 30,000 trainees.

## D.    U.S. ARMY EELT RESEARCH

**Hall 1999:**  Hall's research titled "Optimal scheduling of Army Initial Training Courses" recommends the use of an integer-linear programming model to schedule Army Initial Entry Training (IET) courses for Army enlisted entry-level trainees. The Army IET system consists of two sequential phases, which include Basic Combat Training (BCT) followed by Advanced Individual Training (AIT). The primary problem that Hall identifies in his research is the misalignment between BCT and AIT enrollments, which results in unfilled training seats and increased TAT within the IET system. To resolve that misalignment, Hall proposes an integer-linear programming model that determines the optimal combination of course starts by matching projected BCT enrollments with AIT training seats.

This research report is similar to that of Hall's 1999 report in that both involve enlisted entry-level training and both seek to integrate processes in an effort to maximize class seat utilization and minimize TAT for entry-level trainees. The primary difference is that this report applies supply chain and operations management practices in an effort to identify opportunities to reduce trainee wait time in the system while Hall's research

utilizes an integer-linear programming approach. An additional difference between the two reports is that this research examines each organization in the supply chain in an effort to uncover constraints or policies that might be counter-productive to the efficient flow of inventory, while Hall's research focuses specifically on the BCT and AIT phases of the pipeline.

## E.     CONCLUSION

This chapter discussed seven select research reports that propose various methods of reducing wait time in entry-level training networks. The completion dates of the reports extend between 1993 and 2008. Their methodologies predominately consist of linear programming models but also include qualitative analysis and simulation modeling. The seven studies also examine a mixture of training networks to include the Marine Corps' Officer and Enlisted training pipelines and the Army's enlisted training pipeline. The conclusions presented by the seven reports suggest that entry-level training management is complex and that there are methods available to optimize the flow of inventory such that trainee wait time is reduced and trainee queuing is mitigated.

This research report shares some similarity with the aforementioned studies by Liddell, Whaley, Detar, Justice, Neu, Grant, and Hall. The similarities include the same research area (entry-level training) and comparable research objective (reduce trainee wait time). However, the characteristics of this report that make it unique from the other studies are the methodology (supply chain and operations management) and the scope of the research (analysis of the entire entry-level supply chain vice its segments). The application of supply chain and operations management methodologies to the EELT pipeline is a new and unique approach to improving the way the Marine Corps operates its entry-level training network. Similarly, viewing the EELT pipeline as a supply chain is also a new approach to targeting both trainee wait time and opportunities for process improvement. The supply chain methodology and its focus on end to end integration is the overwhelming difference that distinguishes this study from those that have preceded it. The common thread that links the seven aforementioned studies is their concentration on segments of the entry-level training network vice its entirety. This report examines

the complete supply chain in an effort to identify sustainable process improvement opportunities. The next chapter will provide a discussion regarding the methodologies employed within this research report.

# III.    METHODOLOGY

## A.    INTRODUCTION

The preceding chapters have introduced the research report's background and purpose and provided a discussion regarding work previously accomplished in the area of entry-level training process improvement. The objective of this chapter is to familiarize readers with the areas of Operations Management (OM) and Supply Chain Management (SCM), which are used throughout this report in an effort to analyze the Marine Corps Enlisted Entry-Level Training (EELT) pipeline and identify methods of improving the pipeline's efficiency. A description of OM and SCM are provided in the following sections.

## B.    OPERATIONS MANAGEMENT

Operations Management (OM) is a business discipline that is associated with the production of goods and services. It is defined as the design, operation, and improvement of those processes that create and deliver an organization's primary products and/or services. The field of OM provides a systematic approach to examine an organization's processes in an effort to improve the organization's overall efficiency. The principle OM methodologies utilized in this report are process analysis and queuing analysis. A description of these two OM areas is provided next.

**Process Analysis:** Process analysis is a tool that helps to uncover the various operational steps that exist within an organization. Process analysis can be as straightforward as developing a simple diagram that illustrates the process or steps that exist within an organization. This procedure allows organizations to view their complete set of processes and how those processes function with one another in delivering the organizations product or service. A description of commonly used process analysis terms is provided next.

A **process** is any part of an organization that takes inputs and transforms them into outputs that are of greater value to the organization than their original worth (Jacobs, et al., p. 154). For example, the EELT pipeline is a series of processes that transform

civilians into combat ready warfighters.  A process flow diagram is a physical depiction of a series of processes.  Figure 1 is an example of a process flow diagram that depicts the transformation process that occurs for trainees within the EELT pipeline.

| Civilian | → | Recruit Training | → | Marine Combat Training | → | MOS Training | → | Operational Forces |
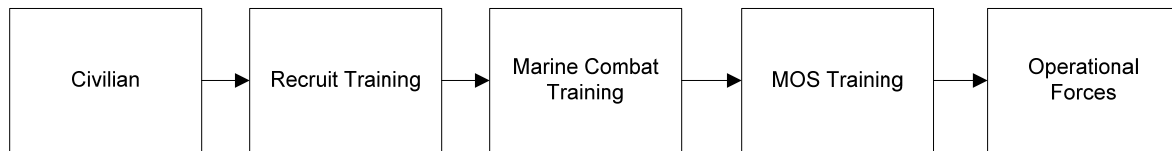
Figure 1.    Process flow diagram

The **cycle time** of a process is the average time between completions of successive units (Jacobs, et al., p. 156).  For the EELT pipeline, the cycle time is considered the duration from when a student arrives at Marine Corps Recruit Training to the time that the trainee completes Military Occupational Specialty (MOS) training.

**Value-added time** is the portion of cycle time where useful activity is performed within a process.  From the perspective of the EELT pipeline, value-added time occurs when trainees are enrolled in training (Jacobs, et al., p. 164).  Conversely, **non-value added time** is the portion of cycle time where no useful activity is being performed, which for EELT trainees would include time spent in holding queues due to unavailability of training resources.

The term **capacity** is defined as "the ability to hold, receive, store, or accommodate".  In a general business sense, capacity is most frequently viewed as the amount of output that a system is capable of achieving over a specific period of time (Jacobs, et al., p. 122).

The **utilization** of a resource is the ratio of time that the resource is actually activated relative to the time that it is available for use.  It can also be considered the amount of the resource's capacity that is used during a process cycle.  Utilization can be applied to the EELT pipeline in terms of evaluating the degree to which formal school capacity, or available class seats, is utilized during a particular fiscal year.

The term **variability** is defined as "the state or characteristic of being variable". Variability describes how spread out or closely clustered a set of data is around its average. In this research report, variability refers to the unpredictability of trainee arrival rates to different phases of the EELT pipeline.

A **bottleneck** is a situation where a single process in a multi-process system limits the capacity of the overall system (Jacobs, et al., p. 159). Bottlenecks can also be described as the weak link in the chain.

The **efficiency** of a process is the ratio of the actual output relative to some standard. The efficiency of the EELT pipeline can be measured in terms of the number of trainees that start and complete each stage of training within the network.

The terms defined above are commonly exercised when applying operations management and process analysis. Process analysis techniques are useful in evaluating an organization's operating characteristics, its individual processes and its overall objective.

**Queuing Analysis:** One of the most important topics within the field of operations management is waiting lines, which is also referred to as queuing (Jacobs, et al., p. 156). Queues exist everywhere from daily commuting to standing in line at the local bank. They also exist in the manufacturing sector such as when raw materials have to wait before being processed through a specific manufacturing procedure. The amount of time a raw material input or person waits in the manufacturing or service function is a key determinate in evaluating the efficiency of a given process. Consequently, one method that organizations can employ to improve efficiency is through increasing capacity. For example, consider a bank that frequently experiences long customer lines throughout the day. The bank can increase service capacity by adding an additional teller, which in turn results in smaller customer queues and less wait time. Successful application of queuing analysis can offer opportunities to reduce cycle time in most organizations. In terms of the EELT pipeline, queuing analysis can offer a unique view of the system that illustrates when and where trainees are delayed.

There are five important steps involved with queuing analysis. First, the system under evaluation is outlined using process analysis in an effort to systematically diagram each of the processes. Second, queuing locations are identified throughout the system. Third, the source of the queuing location is investigated and acknowledged. Fourth, the source of the queuing is targeted. Lastly, recommendations are developed to mitigate the queuing source.

Queuing analysis provides an effective method of identifying system delays and determining why they exist. Applying this method to the EELT pipeline is critical in an effort to develop sustainable process improvement initiatives.

## C.   SUPPLY CHAIN MANAGEMENT

Supply Chain Management (SCM) is an area of business that is concerned with optimizing the transformation process of a product by integrating the entire supply chain from end to end in an effort to reduce total costs and improve performance. SCM is a powerful business application that forces organizations to view all aspects of the organization as one seamless process that if integrated properly can drastically improve the way the organization functions and communicates. The application of SCM in evaluating the EELT pipeline is the primary focus of this research report. The following paragraphs expand upon the field of SCM by describing the basic structure of the supply chain network and illustrating the benefits of SCM through the application of the Beer Distribution Game.

**The supply chain network:** The supply chain is a complex network that involves countless activities controlled by various organizations. One of the chief issues with supply chain management is the challenge of integrating organizations that have conflicting priorities and incompatible objectives. As a result, what is good for one organization in the supply chain is not always good for others. Nevertheless, the organization is inextricably linked from end to end, which is a reality that requires communication and coordination in order to reach its peak potential. A description of a generic supply chain network is provided next.

A supply chain network is divided into two distinct areas, the development chain and the supply chain. The development chain is the segment of the supply chain network where design, planning and other key decisions are developed. The supply chain, on the other hand, is the segment of the network where the products transformation occurs. Consequently, the supply chain segment consists of those processes associated with the acquisition of inputs, manufacturing, and distribution to the customer. Figure 2 is an illustration of a basic supply chain network with the development chain represented by the vertical processes and the supply chain by the horizontal processes.
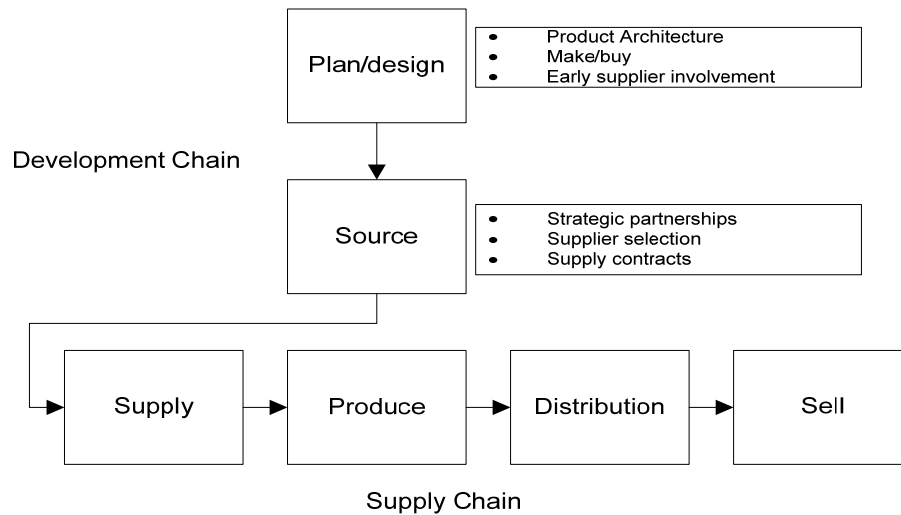


Figure 2.    Supply Chain Network (From: Simchi-Level et al., 2008)

**The Beer Distribution Game:**  The Beer Distribution Game is an instructional tool that is used to demonstrate the challenges associated with a supply chain network that involves various organizations working together in an effort to distribute a product from the manufacturing floor to the sales market. The primary lesson illustrated by the Beer Game is the idea that communication and integration across the supply chain is an absolute necessity in order for the distribution process as a whole to function efficiently, at the lowest total cost and with the highest level of customer service.

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The Beer Game is most often played in groups of four. Each member of the group is assigned a different responsibility within the supply chain. The four roles include, in sequence, the factory, the distributor, the wholesaler, and the retailer. Each component in the supply chain responds to demand orders that are placed by the downstream facility. For example, the factory receives orders from the distributor while the distributor receives orders from the wholesaler, and so on. Each component is assumed to have unlimited capacity. Therefore, the factory is able to produce as many cases of beer that is needed and the downstream activities are capable of holding as much inventory as is necessary.

However, the objective of the game is to realize the highest profit level. Profit occurs when customer orders are satisfied at the retail location. Sales profit is offset by the cost of holding inventory at each stage in the supply chain. Therefore, each member of the group is interested in ordering just enough from the previous activity to satisfy the expected demand from the downstream activity. The only communication allowed between the players is through the use of product order requests. As a result, players must take into account several variables when placing orders. Those considerations include the lead time associated with receiving orders from the previous activity, the level of back orders that must be satisfied if any, and the expected demand from the activities' customer. Players often discover that what appears to be a simple process becomes extremely complicated and exceedingly perplexing.

The challenge that players are confronted with during the Beer Distribution Game is that they often receive less inventory than what was ordered and the demand placed against their activity is routinely unpredictable and highly variable. The source of these challenges can be attributed to a phenomenon called the bullwhip effect. The bullwhip effect is a situation where fluctuations within the supply chain vary upstream and cause activities downstream to order more than they need. The bullwhip effect occurs for several reasons, which include a desire to stockpile inventory in the event of a future spike in demand and the lack of confidence with regard to the ability of upstream suppliers to deliver adequate levels of inventory throughout the course of operations.

Consequently, the bullwhip effect can have detrimental effects on the supply chain, specifically with regard to excess inventory holding costs and the inability of the network to routinely satisfy customer demand.

Participants of The Beer Distribution Game almost inevitably learn two important lessons. First, they discover that retail demand for the supply chain's product is consistent throughout the game, which is contradictory to the observed ordering pattern experienced from the downstream activities. Consequently, players gain an appreciation for the benefits associated with sharing demand information across the supply chain. Second, players realize that the best inventory ordering policy is one where the order quantity is consistent from period to period and, if and when necessary, changes are implemented in small increments. The common link between the two lessons is the notion that supply chains are a collection of organizations such that each link must understand the effects that their decisions have on the system as a whole in order to gain maximum performance.

The Beer Distribution Game and its lessons are applicable to almost any organization to include the EELT pipeline. The game is extremely useful in understanding the dynamics of managing a supply chain and the importance associated with taking a global perspective vice a fragmented approach.

## D.     CONCLUSION

This chapter has provided an overview of the operations management (OM) and supply chain management (SCM) disciplines. OM and SCM represent the primary methodologies used in this report in an effort to evaluate and analyze the Marine Corps Enlisted Entry-Level Training (EELT) pipeline and identify sustainable methods of improving the trainee distribution process. OM and SCM are related but have distinctly different objectives. OM is more locally focused and is ultimately concerned with the design, operation, and improvement of internal processes. In contrast, SCM is more globally focused in terms of integrating the end to end efforts of multiple activities in order to reduce total costs and improve system performance. Together, OM and SCM offer valuable methods and tools designed to improve an organizations processes and operations such that total costs are minimized and overall performance is maximized.

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# IV.  THE ENLISTED ENTRY-LEVEL TRAINING NETWORK

## A.  INTRODUCTION

In the previous two chapters, this report has presented the existing body of Enlisted Entry-Level Training (EELT) pipeline research and described the business concepts that will guide the analysis, conclusions and recommendations.  In this chapter, the report introduces and describes the principle processes that make up the EELT supply chain from force structure and manpower planning to recruiting and completion of all required initial entry-level training.  The principal EELT processes are presented in the following sub-sections.  First, this chapter provides a description of the organizations that support each aspect of the EELT network.  Second, the chapter looks at the EELT developmental process.  Finally, the chapter illustrates the physical network where trainees are recruited and trained.

## B.  ORGANIZATIONS

In this section, the report provides an overview of the organizations that plan, direct, and operate the enlisted entry-level training pipeline from planning to training completion.  These organizations, listed in the order in which they contribute to the pipeline, are Total Force Structure Division (TFSD), Deputy Commandant Manpower and Reserve Affairs (DC M&RA), Marine Corps Recruiting Command (MCRC) and Training and Education Command (TECOM).  The organizational structure of these commands is provided in Figure 3.
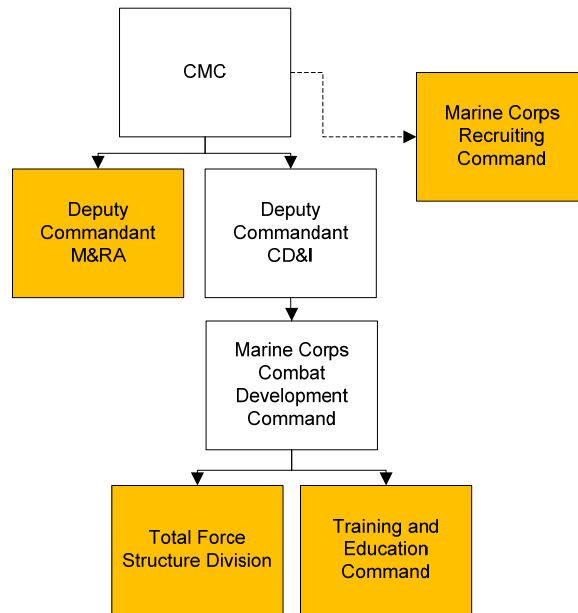
Figure 3.    Headquarters Marine Corps Organizational Chart

**Total Force Structure Division**:  Total Force Structure Division (TFSD) is a subordinate organization under Marine Corps Combat Development Command (MCCDC).  TFSD is the process owner for the Marine Corps' Total Force Structure Process (TFSP) (MCO 5311.1C, 1999, p. 1).  As the TFSP process owner, TFSD determines total force manpower and equipment requirements and allocates resources against those requirements.  TFSD's outputs are the Troop List (T/L) and the Authorized Strength Report (ASR).

**Manpower and Reserve Affairs**:  Deputy Commandant Manpower and Reserve Affairs (DC M&RA), commanded by a Lieutenant General, is in charge of planning, directing, coordinating, and supervising the Marine Corps' Active and Reserve Forces (Manpower and Reserve Affairs, 2010).  DC M&RA works closely with TFSD and utilizes the ASR in order to develop accession and classification plans.  DC M&RA's outputs include the Grade Adjusted Recapitulation Report (GAR), Program Plan, and

Classification Plan. There are three sections in DC M&RA that provide integral contributions to the EELT planning process. They include MPP-50, MPP-20 Enlisted Plans, and MMEA-11 Recruit Classification.

**Marine Corps Recruiting Command (MCRC, 2010):** Marine Corps Recruiting Command (MCRC) is responsible for the procurement of qualified individuals for enlistment or commissioning in the Marine Corps and Marine Corps Reserve. MCRC's Commander, a Major General, reports directly to the Commandant of the Marine Corps on all matters related to enlisted and officer recruiting. MCRC is headquartered in Quantico, Virginia. The command is comprised of two recruiting regions, East and West, with three recruiting districts per region. MCRC's annual enlisted recruiting requirement is provided by accession plans developed by DC M&RA.

**Training and Education Command:** Training and Education Command (TECOM) exists to organize, develop and manage training and education concepts, programs, plans and policies for the Marine Corps. TECOM is commanded by a Major General and reports to the CG Marine Corps Combat Development Command (MCCDC). TECOM is comprised of a headquarters element and several subordinate organizations, which include Training Command, Education Command, Marine Corps Recruit Depot San Diego, and Marine Corps Recruit Depot Parris Island among others (Figure 4). Resident within TECOM's Headquarters is the Formal Schools Training Division (FSTD). FSTD is responsible for developing the Training Input Plan (TIP), which allocates training resources to the training requirements produced primarily by DC M&RA.
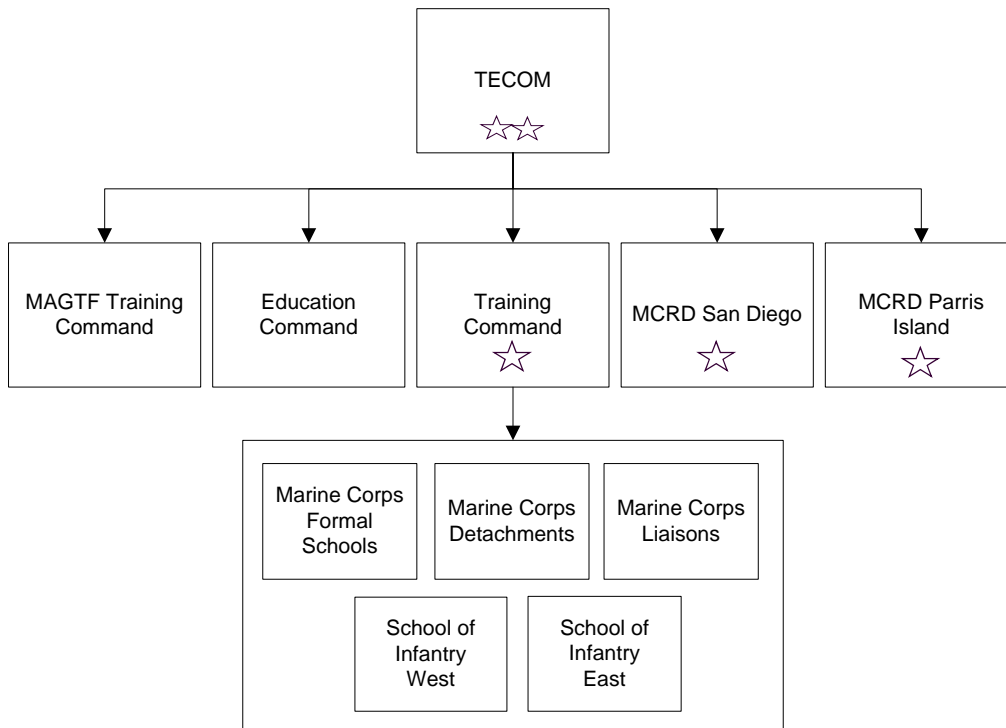
Figure 4.    Organizational Structure of Training and Education Command (TECOM)

Total Force Structure Division, DC M&RA, MCRC, and TECOM work together in an integrated chain in order to facilitate the execution of enlisted entry-level training. The subsequent sections will demonstrate how these organizations work together to support the EELT's development and human supply chains.

## C.    EELT DEVELOPMENT CHAIN

The development segment of the EELT pipeline exists in order to determine the volume and mix of trainee inventory that enters the pipeline each fiscal year.  This segment of the pipeline begins months before the fiscal year commences and involves a host of organizations and planning processes that will be described chronologically in the following paragraphs.

**End Strength:**   The development chain begins with authorized Marine Corps end-strength.  End-strength is the total allowable force structure for the Corps.  End-

strength is recommended by the Marine Corps and approved by Congressional legislation. In 2010, the end-strength of the Marine Corps was 202,000.

**Troop List:** Total Force Structure Division (TFSD) begins the Total Force Structure Process (TFSP) by developing the Troop List (T/L). The T/L is an aggregate total of officer and enlisted table of organization requirements across the Marine Corps. The T/L is determined by taking the authorized end-strength and subtracting P2T2. The T/L, developed semi-annually, becomes the input for the development of the Authorized Strength Report.

**Authorized Strength Report:** TFSD continues the Total Force Structure Process with the development of the Authorized Strength Report (ASR). While the T/L is a macro-view listing of the force structure, the ASR is the micro-view. The ASR provides the authorized strength levels for each organization in the Marine Corps by billet, grade, and military occupational specialty. Similar to the T/L, the ASR is produced semi-annually. The ASR effectively serves as the linking document between Marine Corps Combat Development Command and the Deputy Commandant Manpower and Reserve Affairs (DC M&RA).

**Grade Adjusted Recapitulation:** The development of the Grade Adjusted Recapitulation (GAR) by DC M&RA symbolizes the beginning of the manpower process, which entails building and assigning inventory to fill the structure developed by MCCDC. The GAR takes the micro-view of the ASR and converts it into macro detail that includes specific MOSs and grades and incorporates manpower constraints such as P2T2 and B-billets. The GAR is produced semi-annually by MPP-50 and is the central document for DC M&RA's accession and classification planning.

**Program Plan:** The Program Plan is one of two reports developed by MPP-20. The Program Plan delineates how many trainees per Program Enlisted For (PEF) code are needed for entry into the initial phase of the training pipeline. PEF codes are a grouping of similar military occupational specialties (MOS). For example, the infantry MOSs of 0311, 0331, 0341, 0351 and 0352 are represented by the PEF Code (UH). The PEF code model provides classification flexibility and facilitates the recruiting effort. MPP-20

develops the Program Plan requirement by taking the required inventory needed in the operational forces minus the expected attrition within each phase of the training pipeline. The Program Plan is published on 1 October each year and is used by Marine Corps Recruiting Command for enlisted active duty recruiting in the new fiscal year.

**Classification Plan:** The Classification Plan is developed by MPP-20 and is published on 1 October each year. This plan outlines the required inventory that must be produced in each MOS in order to meet force structure demands. The Classification Plan is used by MMEA-11 and Training Command in order to both classify trainees and measure their annual production progress.

**Training Input Plan:** While the Program Plan and Classification Plan are being developed by DC M&RA, Formal Schools Training Division (FSTD) works simultaneously to develop the Training Input Plan (TIP). The TIP is the operations plan that allocates available training seats to the various requirement sponsors that manage enlisted trainees. The process of developing the TIP begins nine months before the fiscal year. FSTD requests trainee seat requirements in January from MPP-20 for OEE trainees and Reserve Affairs (RAP) for 1E trainees.[1] In March, FSTD hosts the TIP Conference to discuss the upcoming fiscal year training plan. The TIP Conference is attended by the requirement sponsors (MPP and RAP), military occupational managers and Training Command. FSTD finalizes the TIP following the conference and publishes the official Training Input Plan in April. The TIP provides a five-year plan that includes the execution year and four additional years. The published TIP describes the allocation of MOS training seats to the various requirement sponsors by trimester for the upcoming fiscal year. Following publication of the TIP, it becomes the responsibility of Training Command and the MOS Formal Learning Centers to devise their upcoming fiscal year schedules based on the TIP. The schedules are submitted to TFSD in June. TFSD

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[1] OEE is a code that represents active duty enlisted entry-level accession trainees. 1E represents reserve enlisted entry-level accession trainees.

reviews and consolidates the submitted schedules and publishes a combined schedule that is posted in the Marine Corps Training Information Management System (MCTIMS) no later than the July prior to the new fiscal year.

**Classification:** The publication of the TIP in April and the loading of the formal school schedules within MCTIMS in June are critical steps leading up to the classification process that begins several months before the new fiscal year. MMEA-11 is the primary Marine Corps classification authority for active duty enlisted accessions. Classifying is the term used to describe the process of assigning primary MOSs to trainees within the EELT pipeline. In order to accomplish the classification of large groups of trainees, MMEA-11 utilizes a windows-based model called the Recruit Distribution Model (RDM). The purpose of the RDM is to transform trainee PEF codes into primary MOSs based on specific input criteria. The RDM's input criteria include the Classification Plan requirements, MCTIMS formal school schedule data, as well as MOS constraints. The RDM is designed to complete classification for all trainees such that the time between phases in the EELT pipeline is minimized. The classification process of trainees begins several months prior to and during the fiscal year. This process marks the end of our discussion on the development segment of the EELT pipeline.

In conclusion, the development chain of the EELT pipeline is the set of events that occur prior to the physical flow of trainee inventory through the EELT supply chain. It begins with the Marine Corps end-strength and continues with the development of authorized billets by MCCDC, development of inventory requirements by DC M&RA, and the creation of the upcoming fiscal year's Training Input Plan that supports pre-fiscal year and during fiscal year classification. Although the development chain discussion ends here, it is important to note that many of the organizations and their actions discussed in this section continue throughout the fiscal year in an effort to fine-tune the inventory of trainees through the pipeline. Provided next is a discussion of the physical flow of trainee inventory through the EELT supply chain segment.

## D.     EELT SUPPLY CHAIN

The EELT supply chain segment is distinct from the developmental process because it marks the initial flow of physical trainee inventory that is procured by Marine Corps Recruiting Command (MCRC) and subsequently trained by Training and Education Command (TECOM).  This segment of the EELT pipeline consists of enlisted recruiting followed by three training phases, which consist of recruit training, Marine Combat Training, and MOS formal schools training.

**Recruiting:**  Marine Corps Recruiting Command (MCRC) utilizes the Program Plan as the primary requirements document for enlisted recruiting throughout the year. The Program Plan is published by DC M&RA on 1 October, the first day of the new fiscal year.  The Program Plan lays out MCRC's recruiting mission by PEF code.  There are approximately forty PEF codes that MCRC can offer prospective enlistees.  The quantity of each PEF code that must be filled each year is listed in the Program Plan. Internally, MCRC apportions the total Program Plan requirement across the fiscal year in four-month increments called trimesters.  The first trimester of the fiscal year includes October through January (ONDJ), followed by February through May (FMAM), and finally June through September (JJAS).

As MCRC executes their recruiting efforts throughout the fiscal year, shipping plans for new enlistees are integrated across the recruiting districts to ensure an efficient flow of trainees to the two recruit depots.  The shipment of trainees to recruit training is done through the nearest Military Entrance Processing Station (MEPS).  The location of the recruiting district and MEPS is what determines which Marine Corps Recruit Depot will receive the trainee for basic training.  Those districts and MEPS that are located west of the Mississippi River will primarily ship trainees to the Marine Corps Recruit Depot in San Diego, California.  Those districts and MEPS that are located east of the Mississippi River will primarily ship trainees to the Marine Corps Recruit Depot at Parris Island, South Carolina.

The majority of MCRC's annual shipping occurs in the JJAS trimester, approximately forty percent.  The remaining two trimesters individually represent smaller

shipping levels and combine to make up the remaining sixty percent of the mission. The reason behind this trainee-shipping pattern is that the supply of enlistee candidates is exceptionally higher during the high school graduation months of May and June. Consequently, it is during the months of June through September that the majority of young men and women across the country are able and willing to enlist and ship to recruit training. Figure 5 is an example of a typical MCRC operating cycle where the x-axis represents new contract mission total and the y-axis represents the month.
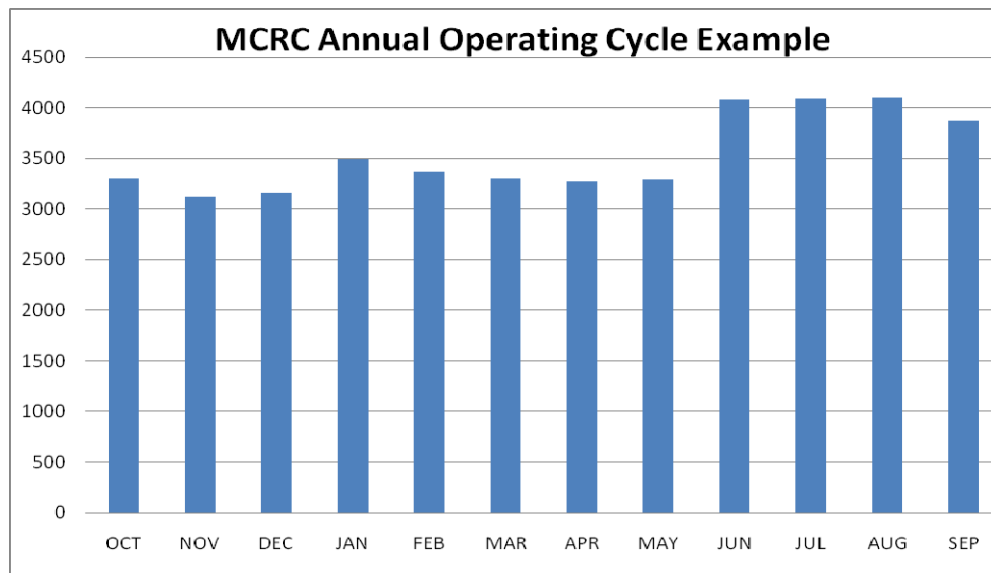


Figure 5. Fiscal Year 2007 Net New Contract Mission

The decision regarding when an applicant officially enlists and ships to recruit training is a give-and-take exchange between what is available and when the applicant desires to depart. Conventional wisdom says that it is often best for enlistees to ship as close to their enlistment as possible in order to avoid issues that might lead to an enlistee voiding the contract, either voluntarily or involuntarily.

Through coordination with MPP-20, MCRC is allocated a finite number of bonuses each year that are available for specific PEF codes, as well as for delayed or accelerated shipment to recruit training. In terms of pay and allowances, trainees do not

receive financial compensation until after arrival at the recruit depot. The next section will discuss the first phase of the EELT training pipeline, recruit training.

**Training Pipeline:** Upon completion of the recruiting process, trainees are shipped to one of two recruit training sites where they will embark upon a three-phase transformation process. The three phases are Recruit Training, Marine Combat Training, and MOS Formal Schools Training (Figure 6). Each is discussed in the next section.



| Phase I<br>Recruit Training | ⟹ | Phase II<br>Marine Combat<br>Training | ⟹ | Phase III<br>Occupational<br>Speciality Training |
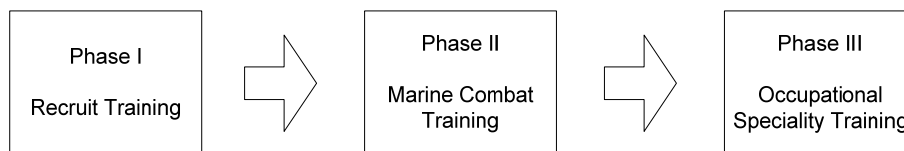
Figure 6.    EELT Pipeline Phases

**Recruit Training – Phase One:** Marine Corps Recruit Training is arguably the most physically and mentally challenging training school in the United States military. It is a rite of passage that Marines, past and present, share in as a symbol of discipline, commitment, and camaraderie. The Marine Corps has two recruit training sites, one located on the west coast (San Diego, CA) and the other on the east coast (Parris Island, SC). The recruit training course of instruction is approximately three months in duration and the curriculum is identical at both sites.

Marine Corps boot camp is a mandatory training requirement for all enlisted trainees regardless of military occupational specialty. Boot camp is intended to provide each enlisted trainee a basic foundation of what it takes and what it means to be a Marine. For obvious reasons, not every trainee that begins Marine Corps boot camp will finish. Historical attrition rates at this level of the EELT pipeline are critical inputs into the forecasts that are developed earlier on in the development process by DC M&RA.

Trainees arrive at recruit training with an assigned PEF code. The PEF code represents the line of work or group of MOSs that the trainee was contracted for. Based on trainee PEF codes, MMEA-11 runs the Recruit Distribution Model (RDM) approximately one month prior to the completion of training for each recruit training

class. The RDM determines the MOS assignment and training path schedule for each trainee in the upcoming recruit training graduate class. The results of each RDM run are posted in the Marine Corps Total Force System (MCTFS) and are later fed into the Marine Corps Training Information Management System (MCTIMS) in order to reserve class seats among the MOS Formal Schools. It is important to note at this point that for several PEF codes, the assignment of the primary MOS is not completed until after arrival at the phase three MOS Formal School destination.

The throughput level at the Recruit Training depots greatly resembles the recruiting pattern that exists across MCRC. As a result of the high recruiting volume that takes place following high school graduations, the recruit depots experience a larger throughput of trainees between June and September than in any other period throughout the year.

Upon completion of boot camp, trainees are afforded ten days of annual leave before being required to report to the next phase of the training pipeline. This ten-day leave period is also referred to as boot leave. There is also a split in the training pipeline for the trainee population that graduates from recruit training. Approximately 77 percent of the annual recruit training throughput continue through the pipeline and subsequently report to Marine Combat Training (MCT) for combat skills instruction. The remaining 23 percent or so represent the infantry MOS trainees that report directly to Infantry Training Battalion for dual-track training in one of approximately five infantry MOS training paths.

Boot camp graduation represents completion of the first phase of the EELT supply chain. The following discussion will cover Marine Combat Training (MCT), which represents phase two of the EELT pipeline.

**Marine Combat Training – Phase Two:** One of the Marine Corps' guiding principles is that every Marine is, first and foremost, a rifleman. Therefore, all trainees with a non-infantry MOS must first attend Marine Combat Training (MCT) prior to proceeding on to their MOS Formal School training path.

Similar to recruit training, there is an MCT school on both coasts. MCT-West is located at Marine Corps Base Camp Pendleton and is one of four training battalions under the command umbrella of the School of Infantry West. MCT-East is located at Marine Corps Base Camp Lejeune and is one of three training battalions under the command of the School of Infantry East. Almost exclusively, all non-infantry trainees that graduate recruit training on the west coast proceed to the west coast MCT and vice versa for east coast trainees.

The MCT course of instruction is 29 days in length and the training is nearly identical at both locations. Upon completion of the MCT program of instruction, trainees are transferred to the first school in their MOS training track to begin Phase Three of the EELT pipeline.

The throughput volume at the MCTs is at their highest point during the ONDJ trimester. The ONDJ trimester throughput peak at the MCTs is correlated with the high recruiting volume that MCRC experiences during the JJAS trimester. Due to the three-month delay represented by recruit training, the JJAS recruiting "bubble," as it is referred to within the organization, does not arrive at the MCTs until the period of October through January.

MCT works closely with several organizations in an effort to streamline the flow of inventory in and out of their schoolhouse. For arriving trainees, the MCTs coordinate with the recruit depots and MMEA-11. After completion of the course, the MCTs work closely with the various MOS Formal Schools to confirm trainee movement across the EELT network.

The following section will discuss the final phase of the EELT training pipeline.

**Primary MOS Training – Phase Three:** The third and final phase of the EELT supply chain is the most complex as it involves the transfer of trainees from the MCTs across a network that spans over 160 different training paths across all four branches of the armed services.

**Infantry MOS Training Track:** For trainees within the infantry MOS field, phase three of the pipeline occurs immediately following Phase One and after the ten-day

boot leave period. Infantry trainees are shipped to either the School of Infantry West (SOI-West) or SOI-East for assignment to Infantry Training Battalion (ITB). While attending instruction at ITB, infantry trainees are classified into one of five different infantry MOSs. Both ITBs are delegated MOS classification authority from MMEA-11, which allows for an efficient means of placing the right trainee in the right infantry MOS.

**Non-Infantry Trainees:** Non-infantry trainees entering Phase Three of the EELT pipeline via MCT are subsequently shipped across a spectrum that includes over 40 military installations and 102 different school locations where trainees receive instruction in over 160 different enlisted primary MOSs[2]. Within that network of over 100 school locations, 37 are operated by the Navy, 26 by the Army, 21 by the Marine Corps, and 18 by the Air Force (Training and Education Command Letter, 2010).

Each enlisted entry-level MOS has an associated training track and sequence. The complexity level of each training track runs the gamut from the very simple to the extremely complex. This disparity is illustrated by comparing the 0121 Personnel Clerk entry-level training (ELT) track with that of the 6124 Helicopter Power Plants Mechanic.

The 0121 MOS path includes one track and one sequence. Consequently, all trainees that are classified as an 0121 on day 52 of recruit training will attend MCT and then transfer to the Personnel Administration School at MCB Camp Lejeune North Carolina. It is there that trainees will attend one of several iterations of the Personnel Clerks course that are offered throughout the fiscal year. Upon completion, the trainee will receive the 0121 MOS and subsequently transfer to the operational forces to serve in that vocation. Figure 7 is a representation of the single-track, single-sequence MOS training track where the green shaded blocks signify that all the schools are managed by the Marine Corps.

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[2] See Appendix A for a complete list of Marine Corps Occupational Fields and Appendix B for a complete list of MOS formal school locations.
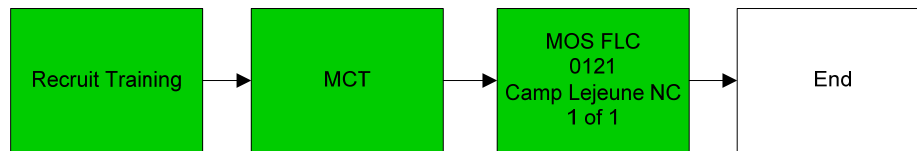
Figure 7.    Single-Track, Single-Sequence MOS Training Track

The 6124 MOS path has two tracks and each track has a five-step sequence.  The five-step sequence means that there are five different schools within the training path that the trainee must complete in order to be awarded the 6124 MOS.  The 6124 MOS includes two tracks meaning that within the sequence, at least one of the schools is offered in two different locations.  For this particular MOS, the first four courses are identical.  Courses one, two, and three of the sequence are taught in Pensacola, Florida and the fourth course in the sequence is taught at MCB Camp Pendleton, CA.  However, the fifth and last course in the sequence is offered in two locations.  The two locations are NAS Jacksonville, FL and NAS North Island, CA.  Therefore, some trainees will follow track one and complete the fifth course in California while others follow track two and complete the final course in Florida.  To further complicate this specific MOS training track, four of the five schools are operated by the Navy and one by the Marine Corps.  Figure 8 represents the multi-track, multi-sequence MOS training path where the green shaded blocks represent Marine Corps led schools and the blue shaded blocks represent Navy managed schools.
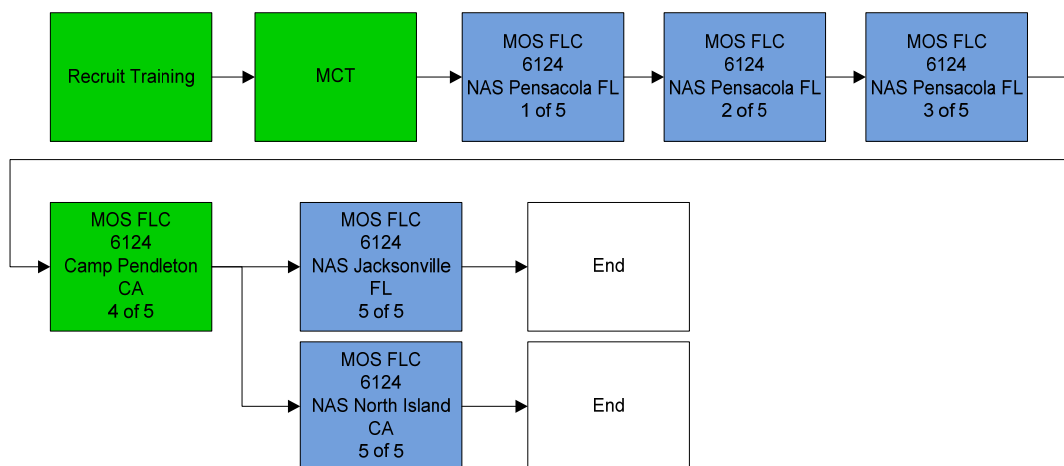


Figure 8.    Multi-Track, Multi-Sequence MOS Training Track

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The aforementioned comparison represents the spectrum of training paths within the EELT pipeline, which spans from the single-track single-sequence Marine Corps formal school path to the multi-track multi-sequence joint-service path. Across the 164 MOS training tracks reviewed, 91 of the tracks consisted of at least two courses while the remaining 73 tracks involved just one. As trainees complete their respective MOS training paths, they are subsequently transferred to the operational forces and officially complete their journey within the entry-level training establishment.

**Permissive Recruiter Assistant Program (PRASP):** The Permissive Recruiter Assistant Program (PRASP) is a formal process whereby trainees are selectively assigned to return to their originating recruiting area to work temporarily during lulls in the EELT pipeline (MCO 1130.62B, 1998). Trainee eligibility for PRASP assignment is initially identified by MMEA-11 during classification. This eligibility is determined based on the results of the RDM run. Those trainees for whom there is a one-week lull or longer prior to their MOS formal school commencement date are flagged for meeting PRASP criteria. The final decision regarding PRASP assignment occurs at the recruit depots and SOIs. Typically, PRASP is approved in conjunction with the ten-day boot leave period. In other cases, trainees are assigned to post-MCT PRASP prior to transferring from phase two of the pipeline. Within the same program, but under a different name, trainees who arrive at their MOS Formal School and are not scheduled to begin instruction immediately are eligible for FRASF.

## E.    CONCLUSION

This chapter outlined the major segments of the global EELT supply chain and identified the principle organizations and processes that facilitate the flow of trainee inventory through the EELT pipeline. The purpose of this comprehensive description is to identify the sequencing and complexity of the EELT supply chain, which paves the way for the analysis and observations provided in the next chapter.

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# V.     EELT PIPELINE ANALYSIS AND OBSERVATIONS

## A.     INTRODUCTION

Chapter IV outlined the steps involved with the planning and execution of the Enlisted Entry-Level Training (EELT) pipeline from the initial strategic planning decisions down to the execution of primary MOS training at the formal learning centers. This chapter provides analysis and observations of the EELT supply chain with the purpose of exposing key operational characteristics that will help facilitate process improvement recommendations.

The EELT pipeline consists of two integrated chains, the development chain and the inventory supply chain. The development chain includes those steps that determine entry-level trainee requirements and serves as the informational inputs to the physical supply chain segment of the overall EELT network. The physical supply chain is the tangible aspect of the network where inventory moves through the procurement and training transformation processes. Figure 9 illustrates the overall EELT network in its two distinct segments.

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                    ┌──────────────┐
                    │              │
                    │ End Strength │
                    │              │
                    └──────┬───────┘
                           ┆
                           ▼
                    ┌──────────────┐
                    │              │
       Development  │     TFSD     │
         Chain      │              │
        (Inputs)    └──────┬───────┘
                           ┆
                           ▼
                    ┌──────────────┐
                    │              │
                    │    DC M&RA   │
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┌──────────┐  ┌──────────┐  ┌──────────┐  ┌──────────┐  ┌──────────┐
│   MCRC   │→ │ Phase One│→ │Phase Two │→ │Phase Three│→│Operational│
│  (Input) │  │  Recruit │  │  Marine  │  │   MOS     │ │  Forces  │
│          │  │ Training │  │  Combat  │  │ Training  │ │ (Output) │
│          │  │          │  │ Training │  │           │ │          │
└──────────┘  └──────────┘  └──────────┘  └──────────┘  └──────────┘

Inventory Supply Chain
(Transformation Process)
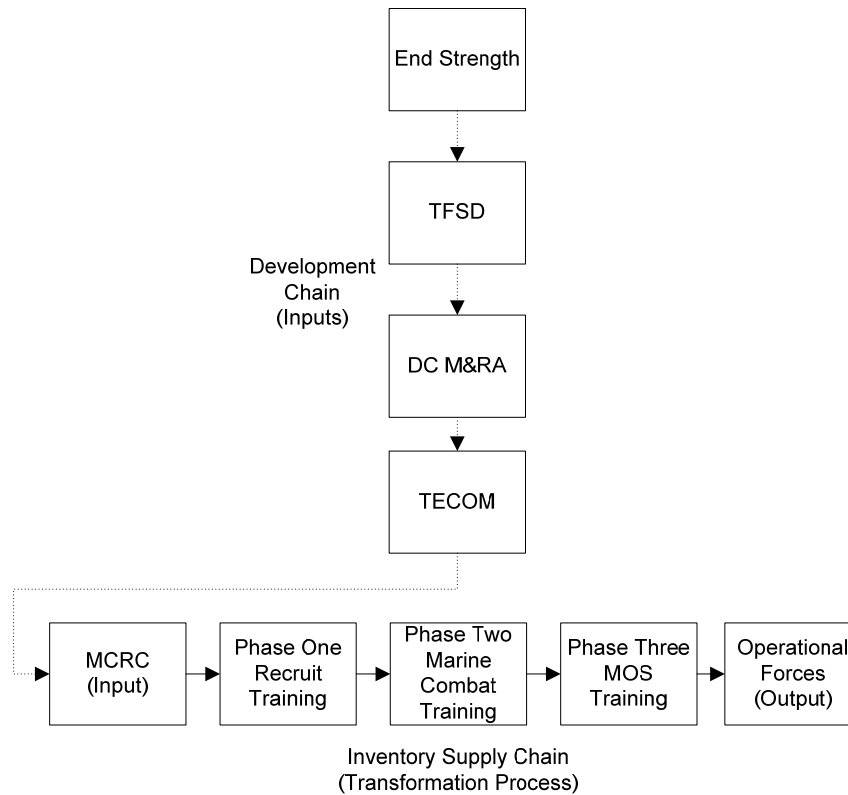
Figure 9.    EELT Development and Inventory Supply Chain Segments

The dashed lines that interconnect the processes within the development chain represent the flow of information between Marine Corps Combat Development Command (MCCDC), Deputy Commandant Manpower and Reserve Affairs (DC M&RA) and Marine Corps Recruiting Command (MCRC).  The solid lines that interconnect the supply chain processes represent the physical flow of trainees from MCRC (inputs), through the transformation process and then out to the Operational Forces (output).

The inventory related segment of the EELT supply chain is illustrated in greater detail in Figure 10.  The planning actions that take place in the development chain serve as the informational inputs for MCRC's trainee inventory procurement process.  MCRC's role of recruiting qualified applicants marks the start of the inventory supply chain by providing the trainees required to start in motion the EELT transformation process, which concludes with the delivery of the final product to the operational forces.
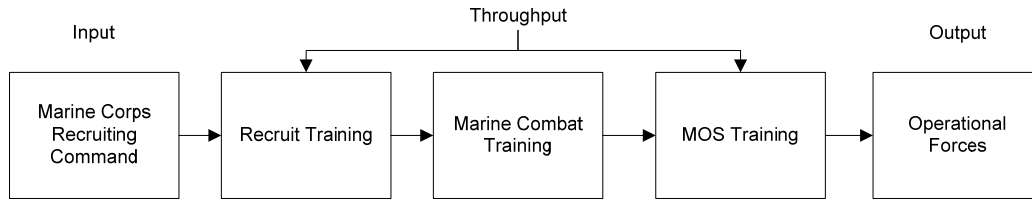
Figure 10.    EELT Inventory Supply Chain

The subsequent sections of this chapter will continue the analysis by taking multiple views of the global EELT network in order to identify its key operating characteristics.  The first view, provided next, is a macro view of the total EELT supply chain.

## B.    MACRO-ANALYSIS OF THE EELT SUPPLY CHAIN

This portion of the analysis offers a process flow illustration of the EELT supply chain followed by an examination of the aggregate system's capacity and utilization characteristics.

**Process Flow:**  Figure 11 is a process flow diagram of the global EELT supply chain, which includes both the developmental chain and the inventory supply chain.
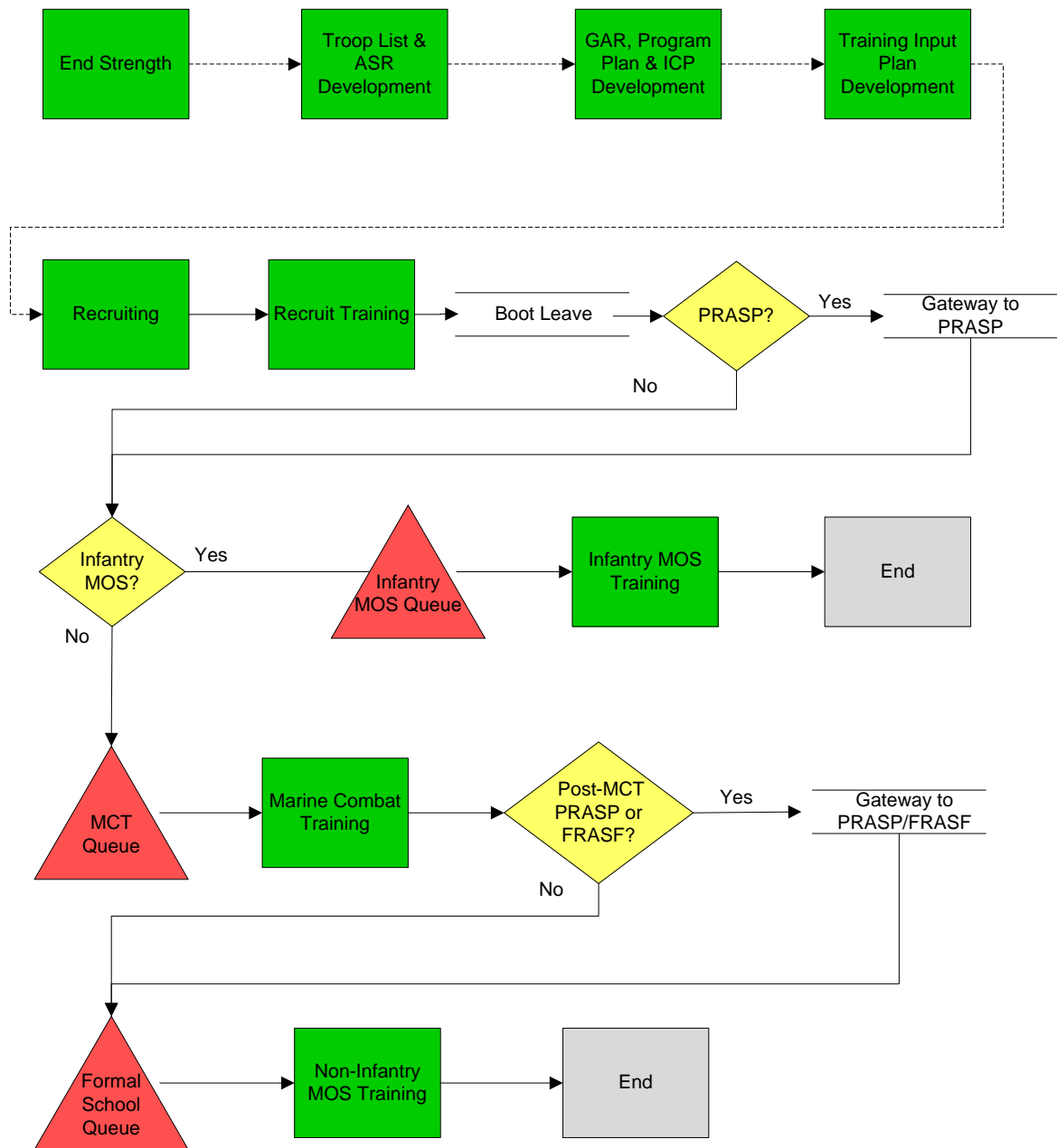
Figure 11.    EELT Pipeline Process Flow Diagram

Figure 11 illustrates the EELT supply chain as a process flow diagram. It provides a physical illustration of the sequential processes that make up the EELT supply chain (identified by the green shaded rectangles). Second, the flow chart shows the locations where trainee inventory can accumulate throughout the pipeline. These inventory locations are represented by the red shaded triangles. Finally, the process flow chart illustrates those points in the supply chain where decisions are made regarding the transformation of trainees. These decision points are represented by the yellow shaded diamonds.

It is important to note the significance of the parallel-lines symbol that appears within the flow chart. The aforementioned symbol represents a delay in the flow of trainee inventory within the supply chain. For example, following the 'Recruit Training' process there is a ten-day delay for trainee inventory due to boot leave. Similarly, there is another potential delay in the flow of trainee inventory following the 'PRASP?' decision point. This delay represents the possible assignment of trainee inventory to the PRASP program.

**Capacity**: An important aspect of any supply chain is its capacity level throughout the system. Quantifying the capacity of the EELT pipeline offers insight into how the system operates under varying levels of throughput. The analysis of the system's capacity is first approached from an aggregate perspective. Capacity calculations for Phase One and Phase Two are provided below with an illustration provided in Figure 12.

1. **Phase One – Recruit Training Annual Capacity**

- Total Annual Capacity = (# classes per year at MCRD-West * maximum trainees per class) + (# classes per year at MCRD-East * maximum trainees per class)

- Total Annual Capacity = (42 * 710) + [(42 * 644)+(21 * 140)] = 59,808 (The additional calculation for MCRD East, (21 * 140), represents female recruit training capacity. All female recruit training is conducted at MCRD East Parris Island.)

## 2. Phase Two – Marine Combat Training Annual Capacity

- Total Annual Capacity = (# classes per year at MCT-West * maximum trainees per class) + (# classes per year at MCT-East * maximum trainees per class)

- Total Annual Capacity = (40 * 450) + (40 * 450) = 36,000

```
┌──────────────────┐         ◇              ┌──────────────────┐    ┌──────────────────┐
│ Recruit Training │    No - Approximately   │ Marine Combat    │    │ Non-Infantry MOS │
│                  │    77% of throughput    │ Training         │    │ Training         │
│ Capacity: 59,808 │──▶ Infantry MOS? ──────▶│ Capacity: 36,000 │───▶│                  │
└──────────────────┘                         └──────────────────┘    └──────────────────┘
                         Yes - Approximately                          ┌──────────────────┐
                         23% of throughput  ─────────────────────────▶│ Infantry MOS     │
                                                                       │ Training         │
                                                                       └──────────────────┘
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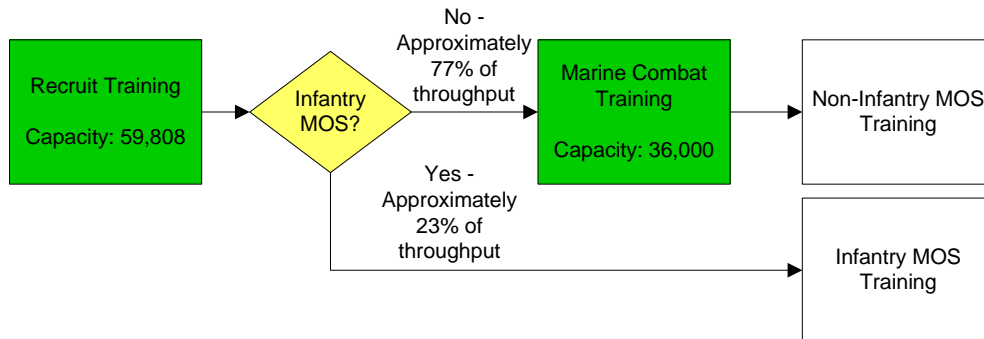
Figure 12.    Capacity Comparison between Recruit Training and MCT

The capacity analysis depicted in Figure 12 illustrates that the recruit training process has a significantly larger throughput capacity than that of the MCT process. The capacity of the MCT process is just 60 percent of the recruit training process capacity (36,000 / 59,808= .60). On average, 77 percent of the annual recruit training population will proceed to MCT. However, MCT only has 60 percent of the processing capacity that the recruit training process has. Although that occurrence alone is not indicative of a potential flaw in the system, it does warrant further investigation for one very important reason. In an ideal network, the capacity structure should be organized such that each process has an equal or greater capacity then the previous operation. Under such a capacity structure, inventory is allowed to flow through the supply chain without delays associated with capacity shortfalls. In the situation depicted in Figure 12, where the preceding operation has a greater throughput capacity than the next, there is the potential for inventory queuing between the two operations. Inventory queuing may develop

because of the potential for throughput from the greater capacity operation to overwhelm the smaller capacity of the following operation. Take, for example, a two-step operation that consists of station one and station two (Figure 13).

```
┌──────────────┐        ┌──────────────┐
│ Station One  │        │ Station Two  │
│              │───────▶│              │
│  Capacity:   │        │  Capacity:   │
│ 2 widgets/min│        │1 widget/minute│
└──────────────┘        └──────────────┘
```
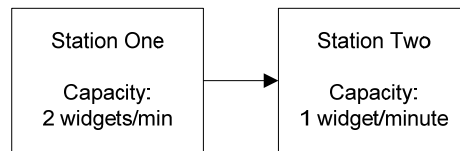
Figure 13.    Two-Step Operation Example

Station one has a throughput capacity of two widgets per minute, while station two has a throughput capacity of one widget per minute. Consider a five-minute operating period where both stations produce at maximum capacity. Station one produces ten widgets while station two can process only five widgets during that time. After the five minute operating period, the resulting work-in-process inventory preceding station two is five widgets waiting to be processed at that station. If station two continues to produce at maximum capacity then the inventory queue at station two will continue to grow.

Figure 12 also portrays a split in the inventory flow following the recruit training process. Approximately 77 percent of the annual trainee population completes recruit training and then proceeds to the MCT process. The remaining trainees (approximately 23 percent) continue to the infantry MOS process. Appendix C illustrates the method developed to determine the approximate percentage of infantry and non-infantry trainees that complete recruit training, which was computed as 23 and 77 percent respectively. Under this construct, the capacity of the recruit training process remains significantly higher than the MCT process even with 23 percent of the throughput going to infantry MOS training. The calculation below illustrates the adjusted capacity of the recruit training process after taking into consideration the divergence of trainee inventory associated with infantry and non-infantry status.

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### 3. Adjusted Recruit Training Capacity

- Annual Recruit Training Capacity * Percentage of Annual Non-Infantry Trainees = Adjusted Recruit Training Capacity with respect to MCT Capacity

    (59,808 * .77 = <u>46,052)</u>

The relevant capacity of the recruit training process with respect to the MCT process is calculated as 46,052. At that capacity level, the recruit training capacity exceeds the MCT capacity by 10,052 (46,052 – 36,000 = 10,052). This result implies that either the capacity of MCT should be increased from 36,000 to 46,052 or the capacity of the recruit training process should be reduced by 10,052 (46,052 – 36,000).

This concludes the discussion of aggregate capacity. Provided next is a utilization analysis for the aggregate EELT supply chain in an effort to identify additional operating characteristics of the EELT network.

**Utilization:** Utilization rates across a supply chain are a good indicator of a network's operational health. Generally speaking, a process with a low utilization rate suggests that the process is over resourced, while a process with a high utilization rate implies an under resourced or stressed process. The latter scenario represents the potential for inventory queuing and suggests that the process may be causing system congestion. In other words, the higher the utilization rate within a process, the more likely that the process is causing a bottleneck in the system.

The following notation will be used to illustrate utilization calculations within this chapter:

$\lambda$    Annual forecasted throughput for FY-11

$\lambda_1$    Annualized forecasted throughput for ONDJ FY-11 Trimester

$\lambda_2$    Annualized forecasted throughput for FMAM FY-11 Trimester

$\lambda_3$    Annualized forecasted throughput for JJAS FY-11 Trimester

$\mu$    Annual service rate or annual capacity

$U$    $\frac{\lambda}{\mu}$, Utilization rate for FY-11

$U_1$   $\frac{\lambda_1}{\mu}$, Utilization rate for ONDJ FY-11 Trimester

$U_2$   $\frac{\lambda_2}{\mu}$, Utilization rate for FMAM FY-11 Trimester

$U_3$   $\frac{\lambda_3}{\mu}$, Utilization rate for JJAS FY-11 Trimester

In order to analyze the annual utilization rates of the recruit training and MCT processes, the analysis uses the expected trainee throughput forecasted for each process for fiscal year 2011 (Training Input Plan, 2010). Table 1 represents the annual utilization calculations for phases one and two of the ELT supply chain.

Table 1.   Throughput, Capacity and Utilization for Recruit Training and MCT

|  | Recruit Training | Marine Combat Training |
| --- | --- | --- |
| λ | 35,750 | 25,683 |
| μ | 59,808 | 36,000 |
| U | 59.8% | 71.3% |

In Table 1, the λ symbolizes the annual forecasted throughput for each of the two processes. The μ indicates the annual capacity, or service rate, of each process. The annual utilization for each process is determined by dividing the annual forecasted throughput (λ) for the process by the capacity of the process (μ).

The resulting utilization rates were 60 percent and 71 percent for recruit training and MCT, respectively. In general, these utilization rates are on the lower end of the desirability range in the context of wanting to maximize training overhead costs. To put these rates into perspective, one can say that the recruit training process has an idle capacity of 40 percent annually and the MCT process has an idle capacity of 29 percent per year. However, a caveat to consider when judging a system's performance based on an annual utilization rate is that the annual calculated rate, on average, may be misleading

or not indicative of the underlying performance throughout the year.  Therefore, the same analysis will be conducted but on a trimester basis vice an annual perspective (Table 2).

Table 2.    Throughput, Capacity and Utilization for MCRD and MCT by Trimester

|  | Recruit Training | Marine Combat Training |
|---|---|---|
| Throughput | | |
| $\lambda$ | 35,750 | 25,683 |
| $\lambda_1$ | 33,249 | 36,258 |
| $\lambda_2$ | 23,727 | 23,886 |
| $\lambda_3$ | 50,724 | 16,905 |
| Capacity | | |
| $\mu$ | 59,808 | 36,000 |
| Utilization | | |
| U | 59.8% | 71.3% |
| $U_1$ | 56% | **101%** |
| $U_2$ | 40% | 66% |
| $U_3$ | 84% | 47% |

To compare the trimester throughput with the capacity of the process, each trimester throughput was multiplied by three months in order to obtain an annualized rate.  For example, the expected throughput during JJAS for recruit training was 16,758.  In order to compare that trimester throughput level of 16,758 to the annual capacity of the recruit training process, the throughput level must be multiplied by three (16,758 * 3 = 50,274).  Therefore, the forecasted annual rate of throughput during the JJAS trimester is 50,274 for recruit training.  That trimester throughput rate is less than the capacity rate of the recruit training process and equals a utilization of 84 percent.

The trimester utilization rates depicted in Table 2 present a different story than that which was exhibited through the annual utilization rate. There are two principle observations drawn from Table 2. First, the utilization rates vary considerably across the three trimesters with recruit training experiencing the highest utilization rate during the JJAS trimester and MCT experiencing the highest utilization rate during the ONDJ trimester. Second, the ONDJ trimester utilization rate for the MCT process is over 100 percent. This result is consistent with the imbalance identified earlier between the capacity of the recruit training process and that of the MCT process.

In an effort to reveal further detail of the EELT supply chain's operational characteristics, this report will analyze the network from the perspective of its east and west coast pipelines. That analysis is provided next.

## C. DISTRIBUTED PIPELINE ANALYSIS

**Capacity:** The prior set of capacity calculations considered both MCRDs (East and West) as one process and both MCTs (East and West) as one process. The following calculations consider both coasts as their own processes that operate simultaneously (Figure 14).
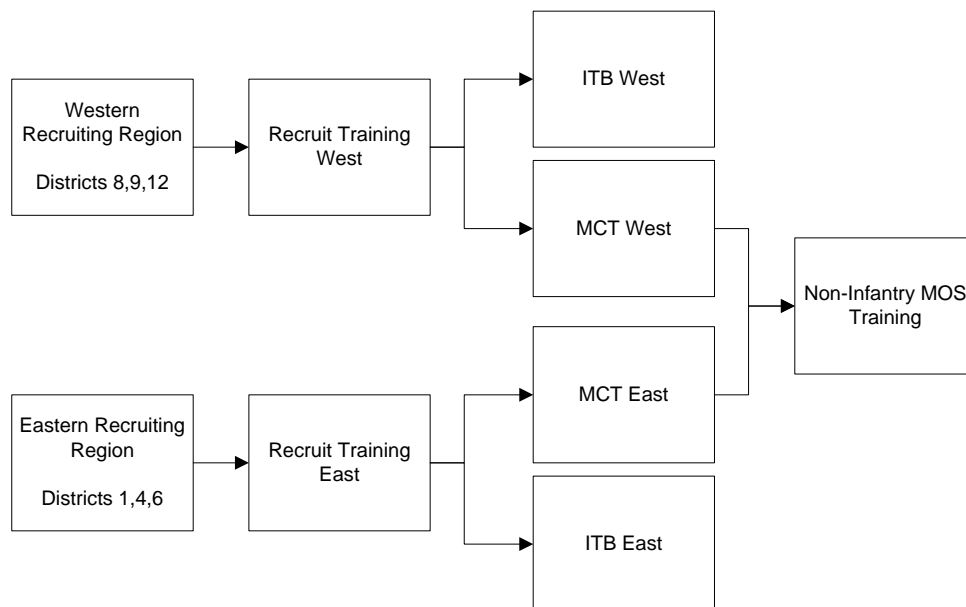


Figure 14.    Distributed EELT Pipeline Perspective

To determine the capacity for each MCRD and each MCT, the number of classes taught per year is multiplied by the maximum number of trainees per class at each location. The resulting capacities are provided in Figure 15.
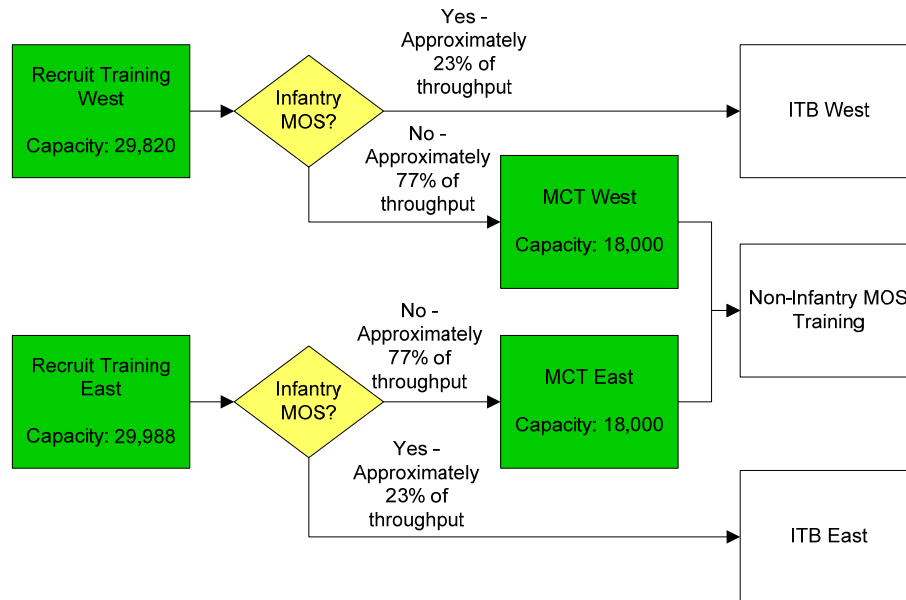


Figure 15.    Capacity Comparison Using a Distributed EELT Pipeline Perspective

In an effort to compare the capacity levels between MCRD West and MCT West, as well as the capacity levels between MCRD East and MCT East, an adjustment is made to account for the 23 percent of the trainee population that does not proceed to the MCTs. The adjusted capacity calculations are provided below.

**1.    Adjusted Recruit Training Capacity**

- Annual MCRD West Capacity * % of Annual Non-Infantry Trainees = Adjusted MCRD West Training Capacity with respect to MCT West Capacity

    (29,820 * .77 = 22,961)

- Annual MCRD East Capacity * % of Annual Non-Infantry Trainees = Adjusted MCRD East Training Capacity with respect to MCT East Capacity

    (29,988 * .77 = 23,091)

The results of the distributed capacity analysis confirm the initial finding that the capacities of the MCRDs on both coasts are significantly higher than the capacity of their respective MCTs. The capacity shortfalls are 4,961 and 5,091 for MCT West and MCT East, respectively. This result implies that either the capacities of MCT West and MCT East should be increased to 22,961 and 23,091, respectively, or the capacities of MCRD San Diego and MCRD Parris Island should be reduced to 24,859 and 24,897, respectively. Provided next is an analysis of the utilization rates within this same context of east and west independence.

**Utilization:** This section calculates utilization rates with a finer degree of detail. It shows the utilization at each of the two recruit depots and each of the two MCT schools. Additionally, it introduces an added level of detail at MCRD East, which is where all female trainees attend recruit training. The utilization results are provided in Tables 3 and 4.

Table 3.    Throughput, Capacity and Utilization for Distributed MCRD by Trimester

| | MCRD East (Male) | MCRD East (Female) | MCRD West |
|---|---|---|---|
| Throughput | | | |
| $\lambda$ | 16,020 | 2,780 | 16,950 |
| $\lambda_1$ | 14,901 | 2,568 | 15,762 |
| $\lambda_2$ | 10,683 | 1,788 | 11,256 |
| $\lambda_3$ | 22,476 | 3,966 | 23,832 |
| Capacity | | | |
| $\mu$ | 27,048 | 2,940 | 29,820 |
| Utilization | | | |
| U | 59.2% | 94.6% | 56.8% |
| $U_1$ | 55% | 88% | 53% |
| $U_2$ | 40% | 61% | 38% |
| $U_3$ | 83% | **135%** | 80% |

Table 4.    Throughput, Capacity and Utilization for Distributed MCT by Trimester

|  | MCT East | MCT West |
|---|---|---|
| **Throughput** | | |
| $\lambda$ | **13,545** | **12,138** |
| $\lambda_1$ | **19,128** | **17,130** |
| $\lambda_2$ | **12,597** | **11,289** |
| $\lambda_3$ | **8,910** | **7,995** |
| **Capacity** | | |
| $\mu$ | **18,000** | **18,000** |
| **Utilization** | | |
| U | **75.3%** | **67.4%** |
| $U_1$ | **106%** | **95%** |
| $U_2$ | **70%** | **63%** |
| $U_3$ | **50%** | **44%** |

The capacity calculations for the distributed EELT supply chain format provide similar results to those that were exposed during the aggregate format analysis. The pattern of higher utilization rates during the JJAS trimester for the recruit depots and ONDJ for the MCTs remains consistent. However, there are three principle findings that result from the refined examination. First, the utilization at MCT West during the ONDJ trimester is below 100 percent but it is close enough to capacity to warrant interest. Second, the utilization rate at MCRD East for female recruit training during the JJAS trimester is significantly over capacity. Finally, the utilization rate at MCT East during the ONDJ trimester is also significantly over 100 percent.

## D. EELT PIPELINE FORMAL LEARNING CENTER ANALYSIS

This section examines the EELT pipeline's final phase in an effort to further reveal operational characteristics of the trainee supply chain. To this end, the report will provide an analysis of the Marine Detachment Fort Leonard Wood, Missouri and specifically the U.S. Army Engineer School.

**Organizational Structure:** The Marine Detachment Fort Leonard Wood, Missouri is located aboard an Army installation, Fort Leonard Wood, and is responsible for the management of Marine EELT trainee throughput within three Army schoolhouses (Figure 16).
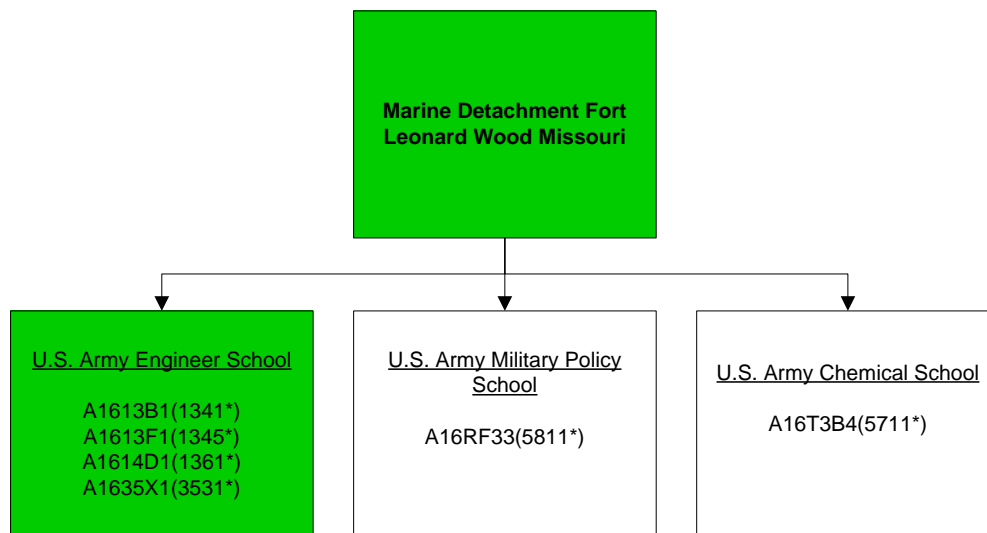


Figure 16.    Organizational Structure, Marine Detachment Fort Leonard Wood, Missouri

As depicted in Figure 16, each schoolhouse provides instruction in one or more primary Military Occupational Specialties (MOS). Within each schoolhouse, for example the U.S. Army Engineer School, the seven digit alphanumeric code represents the course identification code (CID) and the four digit number in parenthesis represents the MOS.[3]

**Capacity:** Provided next is a calculation of the capacity for the MOS programs of instruction (POI) taught for EELT trainees within the U.S. Army Engineer School.

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[3] A description of the CID format is provided in Appendix C.

### 1. Capacity Calculations

- Annual POI capacity = # classes per year * Maximum trainees per class
- U.S. Army Engineer School
  - MOS 1341: 29 * 15 = 435
  - MOS 1345: 48 * 10 = 480
  - MOS 1361: 11 * 4 = 44
  - MOS 3531: 46 * 60 = 2,760

**Utilization:** Now that the trainee capacity for each MOS POI within the U.S. Army Engineer School has been determined, the next step is to use the forecasted fiscal year 2011 (FY-11) throughput data to calculate utilization rates. The utilization calculations are provided in Table 5.

Table 5.     Throughput, Capacity and Utilization for Engineer School by Trimester

|  | FLC MOS 1341 | FLC MOS 1345 | FLC MOS 1361 | FLC MOS 3531 |
|---|---|---|---|---|
| **Throughput** | | | | |
| $\lambda$ | 330 | 429 | 30 | 2,184 |
| $\lambda_1$ | 459 | 594 | 42 | 3,075 |
| $\lambda_2$ | 309 | 402 | 24 | 2,031 |
| $\lambda_3$ | 222 | 291 | 24 | 1,446 |
| **Capacity** | | | | |
| $\mu$ | 435 | 480 | 44 | 2,760 |
| **Utilization** | | | | |
| $U$ | 76% | 89% | 68% | 79% |
| $U_1$ | **106%** | **124%** | **96%** | **111%** |
| $U_2$ | 71% | 84% | 55% | 74% |
| $U_3$ | 51% | 61% | 55% | 52% |

The results of the U.S. Army Engineer School POI utilization rate calculations illustrate two principle findings. First, the mean and median annual utilization rate for each of the four courses is less than 80 percent, which again is on the lower end of the desirability range. A utilization rate of approximately 80 percent equates to an idle capacity of over 20 percent or one fifth of each school's volume capability. Second, the utilization rates within the ONDJ trimester are over capacity for three out of the four POIs, with the fourth POI at a relatively high rate of 96 percent. This ONDJ trimester result is consistent with the ONDJ trimester utilization rates observed at the MCTs.

The following segment discusses the topic of cycle time for the EELT supply chain.

## E.    CYCLE TIME ANALYSIS

This section analyzes the EELT supply chain from the perspective of time.  As discussed in Chapter III, the EELT's cycle time represents the elapsed time between when a trainee reports to recruit training and when they complete their MOS training. Cycle time includes all aspects of trainee inventory flow to include travel time, training time, wait time, administrative processing time, as well as other activities (Figure 17).

| Cycle Time | $=$ | $\sum$ (Training, Travel, Wait Time Between Schools, Administrative Processing, and other Activities) |

Figure 17.    Cycle Time

Related to cycle time is the concept of Rush Order Flow Time (ROFT).  ROFT is a measure of the cycle time minus any wait time.  It represents the minimum amount of time that it would take a trainee to complete the transformation process from recruit training through MOS training completion.  In other words, ROFT represents the total value-added time (Figure 18).

| Rush Order Flow Time | $=$ | Cycle Time $-$ Wait Time |

Figure 18.    ROFT

**ROFT for Phase I and II:**  Provided next is an evaluation of ROFT for each phase of the EELT supply chain in order to reveal operating characteristics of the EELT pipeline with respect to time.

Figure 19 represents the rush order flow time (ROFT) for Phase one and two of the EELT pipeline.

Figure 19.    ROFT, Phase One and Phase Two of EELT Pipeline

Figure 19 illustrates that the ROFT for EELT trainee inventory from commencement of recruit training to completion of MCT is 127 days (88 + 10 + 29 = 127 days).  It is important to note that the ten-day delay associated with boot leave includes travel time and each of the training process durations includes administrative processing and training time.

**ROFT for Phase I – III:**  Provided next is an analysis of ROFT for a complete EELT pipeline path using the U.S. Army Engineer School's MOS 1341 program of instruction (POI).



Figure 20.    ROFT for Complete EELT Pipeline Path, U.S. Army Engineer School's 1341 Program of Instruction

The ROFT calculation for the 1341 MOS training track is 188 days (88 + 10 + 29 + 1 + 60 = 188).  It is important to note that the geographical location of the recruit training site and MCT site is immaterial in our calculation for travel time to the U.S. Army Engineer School.  Consider, for example, a trainee who completes recruit training and MCT on the west coast, which in terms of miles is a longer distance to Fort Leonard Wood than the distance from MCT East to Fort Leonard Wood.  However, since nearly all trainees are provided air transportation from MCT to their MOS school, the allocated travel time according to the Joint Federal Travel Regulations is one day from either MCT (JFTR).  In some cases, the MOS school location is within the same state as the MCT, for

example MCT East and the Marine Corps Combat Service Support School (MCCSSS). Nevertheless, the travel time from MCT West to MCCSSS is one day as is the travel time from MCT East to MCCSSS.

The benefit of the ROFT calculations determined above is that it provides a baseline time measurement that can be used to compare against actual trainee cycle times. For example, consider a trainee in the 1341 MOS track who reports to recruit training on 1 October and completes the 1341 Program of Instruction on 1 August the following calendar year. The cycle time for that particular trainee is 300 days (10 months * 30 days = 300 days). Based on the ROFT for that particular MOS training track, the trainee experienced a delay of 112 days (cycle time – ROFT = 300 – 188 = 112 days).

This concludes the quantitative analysis of the EELT supply chain. The next segment of this chapter will describe the qualitative observations that were made during the course of the research.

## F.     EELT SUPPLY CHAIN QUALITATIVE ANALYSIS

This segment of the report will provide a qualitative analysis of the EELT pipeline based on our research efforts. The analysis is organized into three distinct layers. These layers are consistent with our earlier description of the EELT pipeline and include observations related to the developmental chain, the EELT inventory supply chain, and the overall global EELT network.

**Developmental Chain:**   The developmental segment of the EELT pipeline includes those preparatory actions undertaken by Total Force Structure Division (TFSD), Deputy Commandant Manpower and Reserve Affairs (DC M&RA), and Training and Education Command (TECOM), which serve to facilitate and define the flow of trainee inventory through the EELT supply chain. The following paragraphs describe noteworthy findings within the developmental chain that represent key operational characteristics.

Recruit Distribution Model (RDM):   The RDM is a vital step in the EELT developmental chain and consequently affects the flow of trainee inventory throughout

the supply chain.  There are three significant findings related to the RDM that warrant documentation.  First, the RDM does not have direct connectivity with the Marine Corps Training Information Management System (MCTIMS).  During the classification process, the RDM must draw school schedules and available capacity information from the MCTIMS system.  This process is accomplished manually.  This manual data transfer requirement leaves open the possibility for the RDM to run with old or incorrect MCTIMS data.  Second, the RDM allocates trainees to available primary MOS school seats over two months prior to the course commencement.  The two-month lead time associated with RDM school seat assignments represents a substantial amount of time in which the potential exists for scheduling changes to occur.  Third, the RDM's visibility or ownership of trainee tracking is concluded once the RDM has completed trainee classification.  Therefore, once the RDM has classified the trainee and scheduled the first MOS class start date, no further trainee visibility responsibility remains—unless, for some reason, the trainee must be reclassified.  Trainees who experience delays in the system following classification, which results in missing their scheduled MOS class seat, are not visible to the RDM.  The responsibility of re-scheduling that trainee falls to either the MCT or formal learning center.  This change of trainee ownership opens up the opportunity for breakdowns while inventory transits through the supply chain.

Training Management Information Technology:  The Marine Corps Training Information Management System (MCTIMS) is the primary information technology tool used for EELT pipeline training management.  In addition to the lack of interoperability between MCTIMS and the RDM, there are three other findings regarding MCTIMS that were revealed during our research.  First, the validity of scheduling information and other data within MCTIMS is dependent upon the timeliness and accuracy of user inputs.  Input users of the MCTIMS system include Formal Schools Training Division, the recruit depots, and the formal learning centers (FLC) within Training Command.  For example, all FLCs are required to validate class rosters within five days of each class convening date and must validate completion rosters within seven days of graduation in the Student Registrar tab of MCTIMS (Training Command Order 5401.1, 2010, p. 3-30).  Due to the number of trainees within the EELT pipeline, the ability for FLCs to accomplish

validation on time and accurately becomes a significant challenge. Furthermore, late validations and inaccurate data entries increase the challenges associated with managing and tracking trainees within the pipeline. Second, due to the challenges associated with FLC trainee data input, the value of the MCTIMS database as a data-mining source is degraded. The available data within MCTIMS makes it a valuable source of historical trainee inventory information. However, the reliability of the data for use in process improvement initiatives is questionable due to the open source nature of the system. Consequently, there has been some discussion within Training Command to make MCTIMS management an area that FLCs are inspected on as part of the Commanding General's Inspection Program (CGIP). Finally, each branch of the military manages entry-level training through their own information technology programs. Inter-operability between MCTIMS and the training management systems of the other services does not exist. This lack of joint interoperability across training management IT systems is a lost opportunity in terms of gaining scheduling efficiencies across the joint training environment.

U.S. Army EELT School Scheduling: Due to the joint nature of the EELT pipeline, the scheduling process that transpires between TECOM and the other services is an important element of the EELT development process. There is one important finding that was discovered during our research that is worth highlighting. The planning horizon of the U.S. Army's EELT scheduling process is far greater than that of the Marine Corps, which adds to the difficulty associated with EELT trainee scheduling. The training management timeline presented in Chapter IV is representative of the Marine Corps' process for allocating trainee requirements across available training resources. However, the U.S. Army allocates trainee requirements significantly farther out in the future. For example, the Army requested fiscal year 2012 training requirements from the Marine Corps in September 2009. This represents a period of more than a year before Formal Schools Training Division hosts the fiscal year 2012 Training Input Plan Conference, which is when Marine Corps training requirements are in better focus.

EELT Formal School Scheduling: The process that Formal Learning Centers (FLC) follow in order to develop annual school schedules is an important function within

the training management development process.  The research discovered that this process occurs in an independent manner.  Following the publication of the Training Input Plan (TIP) in April, the FLCs are provided approximately one month to develop their schedules for the following fiscal year based upon the throughput forecasts provided in the published TIP.  The FLCs develop their schedules simultaneously and therefore there is a limited amount of integration that occurs across the pipeline in terms of synchronizing class start dates.  This finding illustrates a potential opportunity for matching class convening dates with the class graduation dates of the previous school in the pipeline in an effort to minimize inventory delay throughout the network.

**EELT Inventory Supply Chain:**  The developmental processes of TFSD, DC M&RA and TECOM serve as a precursor for the physical flow of trainee inventory through the EELT supply chain.  The following observations represent important characteristics of the EELT supply chain discovered during the research.

Marine Corps Recruiting Command (MCRC) Summer Shipping:  The shipment of enlistees from MCRC to the recruit training sites represents the first stage of trainee inventory movement across the EELT supply chain.  The volume at which the recruit depots receive the inventory is a significant factor in the flow of trainee inventory through the system and is the subject of our next two findings.  First and foremost, the single most important characteristic of the EELT supply chain is MCRC's summer shipping spike relative to the rest of the fiscal year.  As presented in Chapter IV, MCRC ships the majority of its inventory to recruit training in the JJAS trimester.  The volume associated with the JJAS recruiting period is often so large that it exceeds the training capacity of the training establishment, which results in inventory accumulation, trainee queuing, and increased inventory lead times.  Second, due to the large push of inventory through the system in the JJAS trimester, there is a significant reduction in trainee inventory throughout the pipeline in the remaining two thirds of the year.  This occurrence was evident in the dramatically lower utilization rates, illustrated earlier in this chapter, at the recruit depot from October to May and at MCT and the FLCs from February to September.

The Year-End Holiday Effect on the EELT Supply Chain: The next observation is directly linked to the previous discussion regarding the large MCRC shipping volume in the JJAS trimester. The large influx of trainees to the recruit depots in JJAS reaches MCT and the FLCs in the months of October through January. Hence, the utilization of MCT and FLC resources are often near or above 100 percent during the ONDJ trimester. Further complicating matters is the occurrence of the year-end holiday season in the middle of what is the busiest trainee throughput period of the operating year. In observance of the year-end holiday period some schoolhouses, both in the Marine Corps and across its sister services, begin to slowly draw down their new class starts in early December in order to minimize the inventory of trainees on hand at the end of the month. This scheduling practice results in lost training capacity during the ONDJ trimester and further aggravates inventory accumulation and trainee wait time. From the perspective of the EELT pipeline, the ONDJ trimester is analogous to a traffic network's rush hour period. Any disruption to the network's available capacity during the rush hour period has the potential to further aggravate congestion and lead to increased wait time for commuters.

The year-end holiday break that occurs each December and January is an example of a disruption in the EELT supply chain. Take, for example, the Marine Detachment Fort Leonard Wood, Missouri. Each December, the Fort Leonard Wood installation suspends nearly all entry-level training courses in observance of Christmas and New Years. As a result, training capacity within the Engineer, Military Police, and Chemical schools is reduced during a period of significantly high inventory levels. Consequently, course utilization rates exceed 100 percent in the ONDJ trimester and inventory continues to build within the supply chain until courses resume following the holiday break.

Additionally, certain scheduling practices during the year-end period can intensify congestion in the supply chain. Consider, for example, a FLC that operates three courses simultaneously with each course separated by one week. Hence, at any one time there are three courses in session and each week there is one course preparing to graduate and another that is preparing to begin. In this scenario, there are two options to

consider during the year-end holiday period. Option one involves suspending courses in session in order to observe the holiday period. This option results in an increase to the training cycle time of each affected course equal to the number of days in the holiday break period. Option two includes eliminating courses prior to the holiday break such that no courses are in session during the break. There are two important implications of the second option. First, option two reduces the FLC's available capacity by the number of days that the courses could have operated prior to the holiday break. Second, in the aforementioned scenario, option two results in the loss of three weeks of course capacity because of the sequencing of the courses. Referring back to the hypothetical scenario, the start date of the three available courses must be separated by one week. Hence, after the holiday break, option two regenerates its capacity by beginning course one on day one, followed by course two on day eight and course three on day fifteen. As a result, course two loses one week of capacity and course three loses two weeks of capacity for a total of 21 days of lost capacity. Therefore, option one is a more effective scheduling practice than option two in terms of maximizing available capacity and minimizing wait time in the EELT supply chain.

Push Inventory System: One of the most essential characteristics of a supply chain is its classification as either a pull or push inventory system. The implications of both have far reaching impacts as to how inventory is managed throughout a supply chain network. The EELT supply chain is an example of a push inventory system. Inventory within a push system is developed and sent through the system at a rate that is decided at the beginning of the supply chain. Consequently, the organizations that exist later in the supply chain have little or no leverage on the decisions regarding inventory flow. Within the EELT supply chain, the recruiting establishment has a principle role in determining the flow and mixture of inventory that enters the pipeline. The formal learning centers have limited visibility with regard to trainee inventory arrival rates, even though they are provided with forecasted TIP data broken down by trimester. Accordingly, the result of the push inventory structure is that the formal learning centers experience variability in the weekly rate of trainee inventory arrivals, which complicates class-scheduling

decisions throughout the operating year. It is important to note that the current practice of developing FLC annual training schedules is a consequence of the push inventory EELT characteristic.

Steady State Recruiting and Flex-Track: The research discovered two process improvement initiatives that were considered in an effort to improve the efficiency of the EELT pipeline. The first initiative, called Steady State, involved evening out MCRC's shipping pattern throughout the operating year so that it more closely mirrored the available capacity of the training establishment. The benefit of such an initiative is the elimination of the large summer influx of trainee inventory and a more even utilization rate for training resources throughout the fiscal year. The difficulty of implementing such a plan is the challenge associated with convincing large volumes of eligible summer month applicants to postpone their enlistments for several months without losing their commitments and consequently failing to meet annual recruiting requirements.

The second process improvement initiative, developed by DC M&RA in the mid 1990s, was titled Flex-Track. Flex-Track was a management technique that sought to combat the large summer recruiting influx by changing the sequence by which trainees progressed through the pipeline in an effort to increase class seat utilization rates. Operationally, the concept shows significant promise at reducing the congestion associated with the recruiting bubble. The challenges associated with the initiative are the physical conditioning of the trainees for whom MCT is the final phase, and the institutional importance attributed to the standard training sequence. The physical conditioning demands on trainees during MCT are challenging. Hence, the challenge of Flex-Track is that the chance of physical fitness degradation during MOS school is high, which could then result in unexpected delays during MCT due to injury or inability to keep pace with the demanding physical regimen. The other challenge with Flex-Track is that the established sequence of the pipeline involves a gradual shift in training culture from the rigid recruit training environment to one that is more flexible and independently focused on learning a specific trade or skill. The idea of altering this progressive sequence is a matter of differing opinion with regard to its effect on trainee learning.

This concludes the report's observations of the physical segment of the EELT pipeline. Provided next are observations regarding the global EELT supply chain.

**Global EELT Supply Chain:** Chapter III discussed the importance of taking a global perspective in order to uncover sustainable ways of improving the overall supply chain process. DC M&RA's Street to Fleet (STF) program is a first-rate illustration of that global context. The Street to Fleet program is an outreach program led by DC M&RA with the goal of educating and communicating across several organizational layers within the EELT supply chain. The outreach effort incorporates personnel from Manpower Plans and Policy, Recruit Distribution, and Marine Corps Recruiting Command travelling across the network to educate and converse with Training and Education Command organizations that are integral to the day-to-day success of the EELT supply chain. The STF program represents a determined integration of all but one of the four major organizations involved with organizing and executing the global EELT network (MCCDC, MCRC & TECOM).

## G. CONCLUSION

This chapter provided the principle operating characteristics that define the EELT network using quantitative and qualitative research analysis and observations. It illustrated that the EELT pipeline has two distinct segments, the developmental chain and the inventory supply chain. Together, the two segments represent the global EELT supply chain. It also analyzed capacity, throughput and utilization for the macro-EELT pipeline, distributed-EELT pipeline and the Formal Learning Center (FLC) level. It discovered a disproportionate capacity level between the recruit training and MCT processes, which suggested that capacities should either be increased at the MCTs or reduced at the recruit depots. Furthermore, the data suggested fluctuating utilization rates across the three trimesters that was marked by high utilization in one trimester and much lower utilization in the remaining two trimesters. The recruit depots displayed high utilization during the JJAS trimester, while the MCTs and FLCs primarily exhibited over utilization during the ONDJ trimester. Finally, the analysis demonstrated the rush order flow time characteristics of the EELT pipeline, as well as highlighting key qualitative findings regarding the network. The next chapter provides a summary of the report followed by conclusions and recommendations.

# VI. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## A. SUMMARY

This research report explored a comprehensive study of the Enlisted Entry-Level Training Pipeline (EELT) with the objective of reducing total costs and P2T2 by concentrating on the efficient management of trainee inventory. A summary of Chapters I through V is provided in the following paragraphs.

Chapter I describes the purpose, background, scope and significance of the EELT study and illustrates the methods and resources used to develop the analysis. The opening chapter provides context to the research topic and serves as the foundation for the analysis, which seeks to identify the fundamental steps in the supply chain, analyze the system's critical characteristics, and provide informed recommendations related to synchronizing the EELT supply chain network.

Chapter II is a literature review on the topic of entry-level training process improvement research. The literature review describes research and literature related to the areas of Marine Corps enlisted and officer entry-level training and Army enlisted entry-level training. The chapter also distinguishes the work previously done on the subject of Marine Corps EELT with the research analysis presented in this report.

Chapter III presents an overview of the operations management (OM) and supply chain management (SCM) disciplines. The OM and SCM business disciplines serve as the underlying methodology of the report's research and analysis. The chapter provides a description of both fields and highlights the significance of OM and SCM in optimizing an organization's processes and supply chain in an effort to reduce total costs.

Chapter IV is a comprehensive description of the United States Marine Corps' Enlisted Entry-Level Training Pipeline (EELT). The chapter provides an organizational description of the four major stakeholders involved in the planning and execution of the EELT pipeline. The chapter also provides an account of the EELT pipeline's processes beginning with force structure and manpower planning and ending with the enlisted

entry-level training establishment.  The chapter is a critical component of the research report in that it provides the structure from which conclusions and recommendations are developed.

In Chapter V, the report provides an analysis of the EELT supply chain by developing a process flow diagram of the system, identifying capacities and utilization rates, illustrating system cycle time and documenting critical observations of the developmental and inventory supply chains.  The chapter utilizes fiscal year 2011 throughput projections to illustrate the misalignment of capacities between phases one and two of the EELT supply chain.  The chapter also uses throughput projections to show the uneven utilization of training resources throughout the operating year and the over-utilization of Marine Combat Training (MCT) and the Formal Learning Centers (FLC) during the October to January trimester.  The analysis and observations presented in Chapter V are the source for the conclusions and recommendations offered in this chapter.

## B.     CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis of the EELT supply chain, this report offers six principle conclusions that represent the most notable characteristics of the pipeline.  Following each conclusion, a recommended course of action is presented with the targeted stakeholders listed in parentheses.

**Conclusion 1**:  MCRC is overburdened with large shipping volumes in the summer months placing a significant strain on the supply chain between June and September at the recruit depots and from October to January at the Marine Combat Training (MCT) schools and Formal Learning Centers (FLC).

**Recommendation**:  Level load the distribution of trainees to the training pipeline such that one third of the annual accession enters the pipeline in each trimester.  This recommendation can be implemented through a wider application of bonuses and delayed entry program management.  This will allow for an even distribution of inventory

throughout the pipeline across the operating year, which will result in the requirement for less pipeline capacity and a more balanced utilization of training resources throughout the fiscal year.  (DC M&RA, MCRC, TECOM)

**Conclusion 2**:  The EELT supply chain is a push inventory system that leads to variability in the arrival of trainee inventory to the Military Occupational Specialty (MOS) FLC's, which complicate efforts to optimize scheduling and minimize trainee delay throughout the operating year.

**Recommendation**:  Develop the EELT supply chain into a pull inventory system.  Eliminate the PEF code assignment and reposition the classification process from recruit training to MCT in order to distribute inventory based on the demands of the MOS schools, which will mitigate costly trainee wait time and reduce P2T2.  (DC M&RA, MCRC, TECOM)

**Conclusion 3**:  The data shows that the recruit depots have excess annual trainee capacity as evidenced by low trimester utilization rates with an average of 60 percent and a maximum value of 84 percent.  Similarly, the data demonstrates that the MCT schools have an insufficient level of annual trainee capacity as evidenced by a utilization rate of 101 percent during the October through January trimester.

**Recommendation**:  Decrease annual training capacity at the recruit depots and increase annual training capacity at the MCT schools.  This recommendation will mitigate the costs of holding excess capacity at the recruit depots, as well as the costs associated with over utilization and inventory accumulation at the MCTs during ONDJ.

**Conclusion 4**:  The planned scheduling respites that FLCs implement during the calendar year-end holiday period occur during the EELT pipeline's most demanding throughput interval.  This interruption further aggravates an already stressed pipeline and results in lost training capacity and increased trainee wait time.

**Recommendation**:  Take full advantage of available capacity at Marine Combat Training (MCT) schools and Formal Learning Centers (FLC) during the October through January trimester by scheduling the maximum number of courses during that time period.

Additionally, mitigate the impact of the year-end holiday respite by training through the holidays or by exploring scheduling practices that minimize the number of training days lost. (TRNGCMD)

**Conclusion 5**: The Marine Corps Training Information Management System (MCTIMS) has the potential to be a core competency for optimizing the flow of trainee inventory in the EELT pipeline but it is currently a missed opportunity.

**Recommendation**: Develop and enhance the MCTIMS information management system and improve its data accuracy by incentivizing organizational use of MCTIMS, developing an automated MCTIMS trainee visibility capability, and establishing interoperability between MCTIMS and other entry-level training information technology systems both internal and external to the Marine Corps (i.e. Recruit Distribution Model and the Army Training Management System). (TECOM)

**Conclusion 6**: A global process improvement approach involving integration among each of the four major EELT organizations, (TFSD, DC M&RA, MCRC, TECOM), is critical towards developing and implementing sustainable methods of improving the performance of the supply chain.

**Recommendation**: Establish a global supply chain approach toward EELT process improvement through the development of an EELT Supply Chain Process Owner focused on integrating the supply chain in order to achieve reductions in inventory, total costs and P2T2 overhead. (MCCDC, DC M&RA, MCRC, TECOM)

## C.  RECOMMENDATIONS FOR FURTHER RESEARCH

This report has provided a framework for understanding the Marine Corps Enlisted Entry-Level Training (EELT) supply chain and potential methods of approaching process improvement initiatives in order to increase system productivity and reduce total costs. The observations and analysis presented in this report serve as a foundation of research that should be examined with more detail in order to discover

additional opportunities to improve the performance of the EELT supply chain. The following are recommended future studies that supplement the research conducted in this report.

1. Conduct a cost analysis of this report's recommendation that suggests that Marine Corps "balance the distribution of trainees to the EELT supply chain across the operating year." This study would involve identifying the implementation costs associated with delaying the arrival of summer accessions to the supply chain through the use of bonuses and other management techniques. Additionally, the study would quantify the costs savings associated with reducing EELT pipeline capacity and the financial benefits of holding less stored inventory in PRASP and FLC queues throughout the supply chain.

2. Conduct an analysis that examines MCT and Formal Learning Center scheduling practices during the ONDJ trimester and year-end holiday period. This research would seek to identify evidence of lost capacity across the EELT pipeline during ONDJ and quantify the loss in terms of P2T2 and financial cost to the Marine Corps. The research may also explore optimal methods of scheduling that would maximize capacity during the peak throughput period of October through January and during the year-end holiday period.

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# APPENDIX A – OCCUPATIONAL FIELDS

01 – Personnel and Administration

02 – Intelligence

03 – Infantry

04 – Logistics

05 – MAGTF Plans

06 – Communications

08 – Field Artillery

09 – Training

11 – Utilities

13 – Engineer, Construction, Facilities, and Equipment

18 – Tank and Assault Amphibious Vehicle

21 – Ground Ordnance Maintenance

23 – Ammunition and Explosive Ordnance Disposal

26 – Signals Intelligence/Ground Electronic Warfare

27 – Linguist

28 – Ground Electronics Maintenance

30 – Supply Admin and Operations

31 – Distribution Management

33 – Food Service

34 – Financial Management

35 – Motor Transport

41 – Marine Corps Community Services

43 – Public Affairs

44 – Legal Services

46 – Combat Camera

48 – Recruiting and Retention

55 – Music

57 – Chemical, Biological, Radiological, and Nuclear Defense

58 – Military Police and Corrections

59 – Electronics Maintenance

60/61/62 – Aircraft Maintenance

63/64 – Avionics

65 – Aviation Ordnance

66 – Aviation Logistics

68 – Meteorology and Oceanography (METOC)

70 – Airfield Services

72 – Air Control/Air Support/Anti-Air Support/Air

73 – Navigation Officer/Enlisted Flight Crews

75 – Pilots/Naval Flight Officers

# APPENDIX B – MOS FORMAL SCHOOL LOCATIONS

Camp Johnson, NC (01xx, 04xx, 11xx, 13xx, 30xx, 31xx, 34xx, 35xx, 60xx, 61xx, 62xx)

Twenty-Nine Palms, CA (06xx, 28xx, 59xx, 61xx, 72xx)

Fort Leonard Wood, MO (13xx, 35xx, 57xx, 58xx)

Pensacola, FL (26xx, 59xx, 60/61/62/63/64/65xx, 70/72/73xx)

Fort Sill, OK (08xx)

Fort Lee, VA (1391, 3381)

Aberdeen, MD (11xx, 13xx, 21xx)

NAS Meridian, MS (6046, 6672, 7041)

Damneck, VA (02xx, 2827)

RedStone Arsenal, AL (2311)

GoodFellow AFB, TX (0241, 7051)

Fort Knox, KY (1812, 2146)

Fort Meade, MD (43xx, 46xx)

Little Creek, VA (0511, 55xx)

Keesler AFB, MS (0648, 28xx, 6494, 68xx)

Lackland AFB, TX (5831)

Athens, GA (6694)

Fort Jackson, SC (0161)

Fort Bliss, TX (7234)

Sheppard AFB, TX (0613)

Fort Gordon, GA (2834)

Newport, RI (4421)

Fort Belvoir, VA (0261, 4616)

Whiting Field, FL (7314)

Virginia Beach, VA (4429)

## APPENDIX C – CALCULATING THE PERCENTAGE OF RECRUIT TRAINING THROUGHPUT REPRESENTED BY INFANTRY AND NON-INFANTRY TRAINEES

According to the Fiscal Year 2011–2015 Training Input Plan (TIP) dated 28 April 2010, the recruit depots are projected to train a total of 35,750 trainees during fiscal year 2011. Additionally, the projection for total infantry trainee throughput for fiscal year 2011 is 8,321. The aforementioned data can be used to determine the approximate percentage of the total recruit depot trainee population that will proceed directly to the Infantry Training Battalions following recruit graduation and the percentage that will proceed to the MCTs. The calculation is provided below.

**Infantry Trainee Percentage for Fiscal Year 2011**

- Approximate % of total recruit training throughput that is classified as infantry = Total infantry trainee throughput forecasted for FY-11 / Total forecasted recruit training trainee throughput for FY-11
  (8,321 / 35,750 = 23%)

The calculation illustrates that approximately 23 percent of all recruit depot trainee throughput are infantry trainees, while 77 percent are non-infantry trainees that proceed to Marine Combat Training School following recruit training.

The calculation depicted above is an approximate value that allows the analysis to make observations about the EELT supply chain using the data provided in the Training Input Plan.

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# APPENDIX D – DESCRIPTION OF THE TRAINING INPUT PLAN (TIP) COURSE IDENTIFIER (CID)

The Course Identifier (CID) is a unique alphanumeric code composed of several identifying elements. The first digit indicates the branch of service as depicted below.

- A (Army)
- C (Civilian)
- F (Air Force)
- M (Marine Corps)
- N (Navy)
- O (International)

The second and third digits refer to the course location. The fourth, fifth, and sixth digits represent Service School Code (SSC), which is a unique 3-digit alphanumeric code specifying an approved formal course of instruction, without regard to location. The seventh digit indicates the individual school name.

The following is a description of the CID **A1613B1:**

- The first character '**A**' stands for Army
- The next two digits indicate the course location, '**Fort Leonard Wood, MO'**
- The next three digits represent the SSC, **'construction equipment repairer course'**
- The last digit denotes the individual school name, **'U.S. Army Engineer School'**

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